LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING

RULES AND REGULATIONS

1906-7

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LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

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9. SPAIN AND PORTUGAL.

BARCELONA *Ship and Engineer Surveyor* ... ... (*Office, Calle de Mallorca 259*; TELEGRAMS, *Muston, Mallorca 259*) — G. E. A. Muston

BILBAO (*Address, Ayala, 1;* TELEGRAMS, *Bareno, Ayala, 1*) — German De Bareno

CADIZ *Ship and Engineer Surveyor*... ...(*Address, Aduana 8;* TELEGRAMS, *West*) — William West

CARTHAGENA *Ship and Engineer Surveyor* (*Address, Calle Palas 5, 2°;* TELEGRAMS, *Perez, Palas 5*) — R. Perez y Ros

LISBON *Ship and Engineer Surveyor* ... ... (*Address, 7, T. do Caes do Tojo;* TELEGRAMS, *Enyap*) — George Payne

OPORTO *Ship and Engineer Surveyor* ... ... (*Office, 49, Rua da Reboleira;* TELEGRAMS, *Ennor*) — Charles J. Ennor

SEVILLE *Ship and Engineer Surveyor* ... ... (*Office, 12, Larana;* TELEGRAMS, *Pina*) — José Pina

10. GIBRALTAR.

GIBRALTAR *Ship and Engineer Surveyor* ... ... (*Address, H.M. Naval Yard;* TELEGRAMS, *Yard*) — C. W. Gregory

11. ITALY AND AUSTRIA.

ANCONA ... ... (TELEGRAMS, *Devon*) — F. G. Emett

FIUME *with the coast south of Pola, and the Dalmatian Islands* ... *Ship and Engineer Surveyor* (*Office, Adria-Palais, Fiume;* TELEGRAMS, *Schnabl, Ingenieur, Fiume*) — Anthony Schnabl

GENOA *Ship Surveyor* (*Office, Piazza S. Giorgio No. 32, 1a Scala;* TELEGRAMS, *Schiaffino, Surveyor*) — Francesco Schiaffino
Ship and Engineer Surveyor ... ... — *Maurice Ritson

* Mr. Ritson is exclusively an Officer of Lloyd's Register.

LEGHORN (*Address, Piazza Micheli, Leghorn;* TELEGRAMS, *A. Gori*) — Amerigo Gori

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

Naples	*with Messina and other ports in Sicily* ... ... *Ship and Engineer Surveyor* (*Residing at Torre Annunziata, near Naples*; Telegrams, *Ducoster*, *Torrannunziata*)	Francesco Ducoster
Trieste	*with Pola and the coast north of Pola.*	
	Ship Surveyor	*Bernard. J. Ives
	Ship and Engineer Surveyor	*C. R. Hughes
	Engineer Surveyor for Steel Testing duties ... ... (*Office, Via San Giorgio No. 5, Trieste*; Telegrams, *Lloydregister*, *Sangiorgio*, *Trieste*)	*A. von Purschka

* These Surveyors are exclusively Officers of Lloyd's Register.

12. MALTA.

Malta	*Ship and Engineer Surveyor* ... (*Office, 21, Strada Zaccaria, Valetta*; Telegrams, *Register*)	C. H. Wright

13. GREECE, TURKEY, TURKEY IN ASIA, AND ROUMANIA.

Constantinople	*Ship and Engineer Surveyor* ... ... (*Office, Arabian Han Momhané, Galata*; Postal Address, *P.O. 77, c/o British Post Office*; Telegrams, *Mumford*)	*Newman Mumford

* Mr. Mumford is exclusively an Officer of Lloyd's Register.

Galatz and Braila	*with a district extending as far as the mouth of the Danube and including Sulina* ... ... (*residing at Braila*; Telegrams, *Archbold*)	T. H. Archbold
Piræus	*Ship and Engineer Surveyor* (Telegrams, *Barnes*)	W. W. Barnes
Syra	*Ship and Engineer Surveyor* (Telegrams, *Eyssartier*)	Edward Eyssartier

14. BRITISH NORTH AMERICA.

Halifax, N.S.	*Ship and Engineer Surveyor* (Telegrams, *Daile*)	J. P. Esdaile
Montreal	(*Address, Port Warden's Office*; Telegrams, *Portwarden*)	Archibald Reid
Prince Edward Island	... ... (*residing at Charlotte Town*; Telegrams, *Register*, *Charlotte Town*)	H. P. Welsh
Quebec	*and the River St. Lawrence* ... *Ship and Engineer Surveyor* (Telegrams, *Samson*)	Joseph Samson
Vancouver City	*including Victoria, Vancouver Island and all ports in British Columbia* ... ... *Ship and Engineer Surveyor* ... ... (*Address, Corner of Seymour and Pender Streets* (*P.O. Box 642*), *Vancouver City*; Telegrams, *Register*, *Vancouver*, *B.C.*)	T. G. Mitchell

15. NEWFOUNDLAND.

St. John's ...	(*Address, 14, Gower Street*; Telegrams, *Surveyor*)	*George Wheatley

* Mr. Wheatley is exclusively an Officer of Lloyd's Register.

16. UNITED STATES.

New York	*Principal Surveyor for the United States*	*James H. Mancor
	Ship Surveyor	*D. Nicholas
	Ship and Engineer Surveyor ... ... (*Office, Kemble Building, 15, Whitehall Street, New York*; Telegrams, *Nymdible*))	*J. H. W. Marsden

* These Surveyors are exclusively Officers of Lloyd's Register.

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

BALTIMORE, MD., WITH NEWPORT NEWS, VA.	*Ship and Engineer Surveyor* (*Office, Stewart Building, South Gay Street, Baltimore*; TELEGRAMS, *Hunter, Baltimore*)	*J. G. Hunter

* Mr. Hunter is exclusively an Officer of Lloyd's Register.

BOSTON, MASS.	*Ship and Engineer Surveyor* ... ... (*Office, Fisk Building, 89, State Street*)	*B. Stewart Murphy

* Mr. Murphy is exclusively an Officer of Lloyd's Register.

GALVESTON, TEXAS,	*Ship and Engineer Surveyor* ... ... (*Address, Cotton Exchange Building*)	T. J. Anderson
NEW ORLEANS, LA.	(*Office, 806, Gravier Street*; TELEGRAMS, *Lawrie*)	Andrew Lawrie
NEWPORT NEWS, VA. (*see* BALTIMORE, MD.).		
PHILADELPHIA, PA.	*Ship and Engineer Surveyor* .. .. (*Office, 324, Bourse*; TELEGRAMS, *Haig*)	*R. Haig

* Mr. Haig is exclusively an Officer of Lloyd's Register.

PITTSBURG, PA.	*For Steel Testing duties* ... ... (*Office, Westminster Apartments, Aiken Avenue*)	*P. McGregor

* Mr. McGregor is exclusively an Officer of Lloyd's Register.

PORTLAND, OREGON	*including both shores of the Columbia River and all ports in Oregon* ... ... (*Office, 80, Third Street*; TELEGRAMS, *Register*)	Lyddon Veysey
SAN FRANCISCO, CAL.,	*Ship Surveyor*	John Metcalfe
	Engineer Surveyor	W. H. Stewart
	(*Office*, ; TELEGRAMS,)	
SEATTLE, WASH.,	*with Tacoma, Port Townsend and all ports in Washington Territory; not including the Washington shore of the Columbia River* ... ... *Ship and Engineer Surveyor* ... ... (*Office, Mutual Life Building, 601, First Avenue, Corner Yesler Way, Seattle*; TELEGRAMS, *Lloyd's*)	James Fowler

17. SOUTH AMERICA.

BUENOS AYRES AND ROSARIO; ALSO MONTE VIDEO	*Ship and Engineer Surveyors* (*Office, Calle San Martin 264, Buenos Ayres*; TELEGRAMS, *Adie*)	*P. I. Adie *J. C. G. Williamson

* Mr. Adie and Mr. Williamson are exclusively Officers of Lloyd's Register.

DEMERARA	(*Address, c/o Harbour Master, Georgetown*; TELEGRAMS, *Heliostat*)	R. T. Wright
PARA ...	*Ship and Engineer Surveyor* (*Office, Rua da Industria, No. 46, Caixa 116*; TELEGRAMS, *Ward*)	John Ward
RIO DE JANEIRO	*Ship and Engineer Surveyor*... (*Address, Caixa 686*; TELEGRAMS, *Register*)	Robert Vance
VALPARAISO	*Ship and Engineer Surveyor* ... ... (*Address, Casilla, 934*; TELEGRAMS, *Smith, Pacific, Valparaiso*)	A. F. Smith

18. EGYPT AND RED SEA.

ALEXANDRIA	*Ship and Engineer Surveyor* ... ... (*Address, The Arsenal;* TELEGRAMS, *Roberts*)	J. E. Roberts
ADEN ...	*Ship and Engineer Surveyor* ... ... (*Address, Hedjiff, Aden;* TELEGRAMS, *Craven*)	C. O. Craven

19. SOUTH AFRICA.

CAPE TOWN	... (*Address, Dock Office;* TELEGRAMS, *Port Captain*)	W. Stephen
EAST LONDON	... (*Address, The Shipping Office;* TELEGRAMS, *Register*)	William Hildyard
PORT ELIZABETH	(*Address, Standard Bank Chambers, Main Street;* TELEGRAMS, *Gowan*)	William Gowan
PORT NATAL	... ... (*Address, 3, Castle Buildings, Durban;* TELEGRAMS, *Airth, Durban*)	Frederick Airth

20. MAURITIUS.

MAURITIUS	... (*residing at Port Louis;* TELEGRAMS, *McDonald, Mauritius*)	M. S. McDonald

21. INDIA, CEYLON, BURMAH, AND STRAITS SETTLEMENTS.

AKYAB	... ... (TELEGRAMS, *Lloyd's Surveyor*)	G. B. Brown
BOMBAY	*Ship and Engineer Surveyor* (*Office, 15, Bank Street, Fort, Bombay;* TELEGRAMS, *Surveyor*)	A. L. Whittell
CALCUTTA	*Ship and Engineer Surveyor* (*Office, 2, Hare Street;* TELEGRAMS, *Surveyor*)	*T. W. Fish

* Mr. Fish is exclusively an Officer of Lloyd's Register.

COLOMBO	*Ship and Engineer Surveyor* (TELEGRAMS, *Ratsey*)	H. B. Ratsey
KURRACHEE	*Ship and Engineer Surveyor* (*Address, Kutchery Road, Kurrachee;* TELEGRAMS, *Hughes*)	J. Hughes
PENANG	*Ship and Engineer Surveyor* ...(TELEGRAMS,)	
RANGOON	(*Address, Lower Poozoondoung;* TELEGRAMS, *Surveyor*)	R. P. Taylor
SINGAPORE	*Ship and Engineer Surveyor* (*Office, 7E, Battery Road;* TELEGRAMS, *Webb*)	*F. W. Webb

*Mr. Webb is exclusively an Officer of Lloyd's Register.

22. EAST INDIAN ARCHIPELAGO.

BATAVIA	... ... (TELEGRAMS, *Taalingen*)	H. van Taalingen
MANILA, P.I.	*and Ports in the Philippine Islands* ... ... *Ship and Engineer Surveyor* ... ... (*Address, 25, Plaza de Goiti (P.O. Box 307);* TELEGRAMS, *Turbine*)	William Swann
SOURABAYA	*Ship and Engineer Surveyor* ... ... (*Address, Goebeng;* TELEGRAMS, *Lecomte, Engineer*	J. W. Le Comte

23. CHINA AND JAPAN.

HONG KONG	*Ship and Engineer Surveyor* ... ... (*Office*, 5, *Alexandra Buildings;* TELEGRAMS, *Marine*)	*John Lambert

* Mr. Lambert is exclusively an Officer of Lloyd's Register.

KOBÉ, HIOGO	*Ship and Engineer Surveyor* ... ... (*Office*, 53, *Harima Machi;* TELEGRAMS, *Ellerton*)	James Ellerton
NAGASAKI	*Ship and Engineer Surveyor* ... ... (*Address*, 6, *Minami Yamate ;* TELEGRAMS, *Register*)	*A. C. Heron

*Mr. Heron is exclusively an Officer of Lloyd's Register.

SHANGHAI	*Ship and Engineer Surveyor*...(TELEGRAMS, *Paulsen*)	V. C. Paulsen
YOKOHAMA	*Ship and Engineer Surveyor* ... ... (*Office*, 23, *Water Street;* TELEGRAMS, *Register*)	*A. S. Williamson

* Mr. Williamson is exclusively an Officer of Lloyd's Register.

HAKODATE	*Asst. Ship and Engineer Surveyor* ... ... (*Address*, 5, *Kaisho Machi;* TELEGRAMS, *Yamada, Kaishomachi*)	Sakuro Yamada

24. AUSTRALIA AND NEW ZEALAND.

ADELAIDE, S.A.	(*Office, Lipson Street, Port Adelaide;* TELEGRAMS, *Gibbon*)	J. H. Gibbon
AUCKLAND, N.Z.	(TELEGRAMS, *Replento*)	M. T. Clayton
BRISBANE, QUEENSLAND	(*Address, Parbury's Buildings, Eagle Street;* TELEGRAMS, *Surveyor*)	R. S. Taylor
CHRISTCHURCH AND LYTTELTON, N.Z.	(*residing at Lyttelton;* TELEGRAMS, *Willis*)	Stewart Willis
DUNEDIN, N.Z.	*Ship and Engineer Surveyor* ... ... (*Address*, 3, *High Street;* TELEGRAMS, *Cellular*)	A. Morrison
FREMANTLE, W.A.	*Ship and Engineer Surveyor* ... ... (*Address, Harbour Office;* TELEGRAMS, *Ramage*)	A. Ramage
MELBOURNE, VICTORIA	*Ship and Engineer Surveyor* ... ... (*Address, New Zealand Chambers, 483, Collins Street;* TELEGRAMS, *Reports*)	Alexander McCowan
NAPIER, N.Z.	(TELEGRAMS,)	
NEWCASTLE, N.S.W.	(TELEGRAMS, *Backstay*)	J. W. Vellacott
PORT PIRIE, S.A.	*including Port Germein and Wallaroo* ... ... (*Address, Ellen Street, Port Pirie;* TELEGRAMS, *Mars*)	Alfred M. Mars
SYDNEY, N.S.W.	*Ship and Engineer Surveyor* (TELEGRAMS, *Miramar*)	*R. Pollock

* Mr. Pollock is exclusively an Officer of Lloyd's Register.

WELLINGTON, N.Z.	(TELEGRAMS, *Bendall*)	William Bendall

LONDON,

June, 1906.

LIST OF SURVEYORS OF LLOYD'S REGISTER

(ALPHABETICALLY ARRANGED).

THE SURVEYORS AT THE PORTS MARKED * ARE EXCLUSIVELY THE OFFICERS OF THE SOCIETY AND ARE NOT PERMITTED TO ENGAGE IN ANY OTHER BUSINESS OR EMPLOYMENT WHATSOEVER.

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*LONDON (TELEGRAMS, *Committee*)	HARRY J. CORNISH, *Chief Ship Surveyor of Lloyd's Register*	Jesse Williams, *Principal Surveyor for London District.*
	George Stanbury, S. J. P. Thearle — *Assistants to Chief Ship Surveyor...*	J. Bruhn, D.Sc. J. W. Isherwood G. F. Robson
	Principal Surveyors on the Chief Ship Surveyor's Staff: C. Buchanan — Geo. R. Mares C. Fowling — Chas. H. Jordan	R. B. Watt R. Langlands J. W. Grier J. Montgomerie
	JAMES T. MILTON, M.Inst.C.E., *Chief Engineer Surveyor of Lloyd's Register*	H. A. Gibbs C. C. Gearing W. Watt G. Nicol W. Dawson, B.Sc.
	J. E. Stoddart, *Assistant to Chief Engineer Surveyor*	
	Engineer Surveyors, and Ship and Engineer Surveyors...	T. R. Blackie E. M. Salmon R. Balfour F. L. Sturgeon C. M. B. Dyer C. Martell J. B. A. Common J. E. Milton A. J. Barrett
	Draughtsman	David S. Hunter
	Examiner of Masts, Spars and Rigging	H. J. West
*ABERDEEN	*Ship and Engineer Surveyors* (*Office*, *29*, *Regent Quay*)	R. Fowell J. C. Turpin
ADELAIDE, S. A.	(*Office*, *Lipson Street*, *Port Adelaide*; TELEGRAMS, *Gibbon*)	J. H. Gibbon
ADEN	*Ship and Engineer Surveyor* ... ... (*Address*, *Hedjiff*, *Aden*; TELEGRAMS, *Craven*)	C. O. Craven
AKYAB	... ... (TELEGRAMS, *Lloyd's Surveyor*)	G. B. Brown
ALEXANDRIA	*Ship and Engineer Surveyor* ... ... (*Address*, *The Arsenal*; TELEGRAMS, *Roberts*)	J. E. Roberts
*AMSTERDAM	*Ship and Engineer Surveyor* ... ... (*Office*, *Nassaukade*, *167*)	J. B. Slebe
ANCONA	... ... (TELEGRAMS, *Devon*)	F. G. Emett
*ANTWERP	(*Surveyors' Office*, *28*, *Ouest Quai*, *Kattendyk*; TELEGRAMS, *Register*)	J. G. G. Rule, *Principal Surveyor.*
	Ship and Engineer Surveyors...	H. A. Ruck-Keene H. P. Cornish

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

AUCKLAND, N.Z.	... ... (TELEGRAMS, *Replento*)	M. T. Clayton
*BALTIMORE, MD., WITH NEWPORT NEWS, VA.	*Ship and Engineer Surveyor* ... ... (*Office, Stewart Building, South Gay Street, Baltimore;* TELEGRAMS, *Hunter, Baltimore*)	*J. G. Hunter
*BANGOR	(*Address, Rosia, Melinda Terrace*)	Thomas Riley
BARCELONA	*Ship and Engineer Surveyor* ... ... (*Office, Calle de Mallorca 259;* TELEGRAMS, *Muston, Mallorca 259*)	G. E. A. Muston
*BARROW	*Ship and Engineer Surveyor*	J. Easthope
	Ship Surveyor ... ... (*Office, Ramsden Square*)	A. Allen
*BARRY	*Ship and Engineer Surveyors* ... ... (*Office, Dock Chambers, Barry Dock*)	Wm. J. Darling J. G. Mackillop A. Couper
	Ship Surveyor	T. G. Baker
BATAVIA	... ... (TELEGRAMS, *Taalingen*)	H. van Taalingen
*BELFAST	*Ship and Engineer Surveyor* ... ... *Ship Surveyor* ... ... (*Office, 53, Waring Street*)	R. J. Beveridge E. J. Milton
BERGEN	*Ship and Engineer Surveyor* ... ... (TELEGRAMS, *Surveyor*)	S. A. Eide
*BIDEFORD	... ... (*Residing at Appledore*)	G. Westcott
BILBAO	(*Address, Ayala, 1;* TELEGRAMS, *Bareno, Ayala, 1*)	German De Bareno
BOMBAY	*Ship and Engineer Surveyor*... (*Office, 15, Bank Street, Fort, Bombay;* TELEGRAMS, *Surveyor*)	A. L. Whittell
BORDEAUX	*Ship Surveyor* ... (*Address,* 16, *rue Esprit des Lois;* TELEGRAMS, *Albert Vandercruyce*)	Albert Vandercruyce
	Engineer Surveyor (TELEGRAMS, *Arthur Donzelle*)	Arthur Donzelle
*BOSTON, MASS.	*Ship and Engineer Surveyor* ... ... (*Office, Fisk Building, 89, State Street*)	B. Stewart Murphy
BRAILA AND GALATZ	... (*residing at Braila;* TELEGRAMS, *Archbold*)	T. H. Archbold
BREMERHAVEN	*Ship and Engineer Surveyor for Weser District* ... (*Office, Burgermeister Smidstrasse, No. 18;* TELEGRAMS, *Ferd. Thomsen*)	F. H. T. Thomsen
BRISBANE, QUEENSLAND	(*Address, Parbury's Buildings, Eagle Street;* TELEGRAMS, *Surveyor*)	R. S. Taylor
*BRISTOL	*Ship and Engineer Surveyor* (*Office, 53, Queen Square*)	C. Cooper

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*BUENOS AYRES AND ROSARIO ; ALSO MONTE VIDEO	*Ship and Engineer Surveyors* (*Office, Calle San Martin 264, Buenos Ayres;* TELEGRAMS, *Adie*)	P. I. Adie J. C. G. Williamson
CADIZ	*Ship and Engineer Surveyor* (*Address, Aduana, 8 ;* TELEGRAMS, *West*)	William West
*CALCUTTA	*Ship and Engineer Surveyor* (*Office, 2, Hare Street ;* TELEGRAMS, *Surveyor*)	T. W. Fish
CAPE TOWN	(*Address, Dock Office ;* TELEGRAMS, *Port Captain*)	W. Stephen
*CARDIFF	... ...	Andrew K. Hamilton, *Principal Surveyor.*
	Ship Surveyors ... ... (*Office, Merchants' Exchange, Bute Docks, Cardiff*)	Henry Hand W. S. P. Collings M. Macleod
	Engineer Surveyor, and Ship and Engineer Surveyors	G. L. Hindmarsh J. Pollock J. M. Buchanan H. A. Stewart
CARTHAGENA	*Ship and Engineer Surveyor* (*Address, Calle Palas 5, 2°;* TELEGRAMS, *Perez, Palas 5*)	R. Perez y Ros
*CHANNEL ISLANDS	(*Office, 15, Mulcaster Street, St. Helier's, Jersey*)	J. F. Picot
CHRISTCHURCH & LYTTELTON, N.Z.	... ... (*residing at Lyttelton ;* TELEGRAMS, *Willis*)	Stewart Willis
CHRISTIANIA	*Ship and Engineer Surveyor* (*Address, 19, Kongens Gade ;* TELEGRAMS, *Surveyor*)	O. C. Sanne
COLOMBO	*Ship and Engineer Surveyor* (TELEGRAMS, *Ratsey*)	H. B. Ratsey
*CONSTANTINOPLE	*Ship and Engineer Surveyor* (*Office, Arabian Han Momhané, Galata ; Postal Address, P.O.77, c/o British Post Office ;* TELEGRAMS, *Mumford*)	Newman Mumford
*COPENHAGEN	*Ship and Engineer Surveyors* ... ... (*Office, Amaliegade 36I, Copenhagen, K.* ; TELEGRAMS, *Engineer*)	H. J. Sonne A. F. Örbech A. T. Poulsen
DANZIG	*Ship and Engineer Surveyor* ... ... (*Address, 50, Seestrasse, Zoppot, near Danzig*)	Carl Schirnick
DEMERARA	(*c/o Harbour Master, Georgetown;* TELEGRAMS, *Heliostat*)	R. T. Wright
DOVER	... ... (TELEGRAMS, *Harbour Master*)	John Iron
*DUBLIN	*Ship and Engineer Surveyor* ... ... (*Address, 115, Philipsburg Avenue*)	J. Macwilliam
*DUNDEE	*Ship and Engineer Surveyor* ... ... (*Office, Maritime Buildings, East Dock Street*)	W. Morrison
DUNEDIN, N.Z.	*Ship and Engineer Surveyor* (*Address, 3, High Street ;* TELEGRAMS, *Cellular*)	A. Morrison
DUNKIRK	*Ship and Engineer Surveyor* (*Office, rue des Pierres 22;* TELEGRAMS, *Morel, Lloyd's*)	F. C. Morel
*DÜSSELDORF	*Ship and Engineer Surveyors for Steel Testing duties and Inspection of Forgings, &c., in Germany and Belgium* (*Address, Herderstrasse 70, Düsseldorf;* TELEGRAMS, *Meijer, Herderstrasse 70*)	J. Meijer M. Koch K. Hauss P. F. J. Abel
EAST LONDON	(*Address, The Shipping Office ;* TELEGRAMS, *Register*)	William Hildyard

*FALMOUTH	*Ship Surveyor* ... ... (*Surveyors' Office, Pendennis House, Lansdowne Road*)	T. H. Sandry
	Ship and Engineer Surveyor	R. H. Cooper
FIUME	*Ship and Engineer Surveyor* (*Office, Adria-Palais;* TELEGRAMS, *Schnabl, Ingenieur, Fiume*)	Anthony Schnabl
FLENSBURG	*and other Ports in Schleswig-Holstein* (*See* HAMBURG.)	
FREMANTLE, W.A.	*Ship and Engineer Surveyor* ... ... (*Address, Harbour Office;* TELEGRAMS, *Ramage*)	A. Ramage
GALATZ and BRAILA	(*residing at Braila;* TELEGRAMS, *Archbold*)	T. H. Archbold
GALVESTON, TEXAS	*Ship and Engineer Surveyor* ... ... (*Address, Cotton Exchange Building*)	T. J. Anderson
*GENOA	*Ship Surveyor* (*Office, Piazza S. Giorgio No. 32, 1a Scala;* TELEGRAMS, *Schiaffino, Surveyor*)	†Francesco Schiaffino
	Ship and Engineer Surveyor	Maurice Ritson
GIBRALTAR	*Ship and Engineer Surveyor* (*Address, H.M. Naval Yard;* TELEGRAMS, *Yard*)	C. W. Gregory
*GLASGOW	*Ship Surveyors* ... (*Office, 342, Argyle Street;* TELEGRAMS, *Register*)	Thomas J. Dodd, *Principal Surveyor.* James L. Sinnette, J. D. Mares, T. J. House, F. R. Noton, R. Wright, J. McIlvenna, R. S. Rowntree, A. B. R. Harris, G. M. Shaw, N. E. McClelland, P. H. Mackellar, M. Blackwood, R. M. McLaren, J. Dickie, J. F. Isherwood, J. S. Butler, W. G. Haig
	Principal Engineer Surveyor for Glasgow District ...	James Mollison
	Engineer Surveyors, and Ship and Engineer Surveyors	A. L. Jones, A. McKeand, G. Murdoch, J. W. Dimmock, H. Gardner Smith, W. G. Minchin, J. S. Cairns, J. S. Blackett, A. T. Thomas, J. W. Gwynne, C. H. L. Pilditch, W. Butler, A. A. A. Chalmers
	Inspectors of Forgings for the Clyde District	W. Hamilton, A. Fletcher

† Mr. Schiaffino is not exclusively an Officer of Lloyd's Register.

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*GOTHENBURG	*Ship and Engineer Surveyors* (*Office, Hertzia, Packus-platsen, 2;* TELEGRAMS, *Surveyor*)	V. C. Bülow G. W. Jörgensen
*GREENOCK AND PORT GLASGOW	... . *Ship Surveyors* (*Office, Commercial Bank Buildings, 14, Cross-shore Street, Greenock*)	E. J. Tierney, *Principal Surveyor.* D. McAuslan J. French J. Craig
	Ship and Engineer Surveyors	W. R. Austin R. Elliott, B.Sc.
*GRIMSBY AND BOSTON	*Ship and Engineer Surveyors* (*Office, Bank Chambers, 2, Freeman Street, Great Grimsby*)	B. G. Oxford G. D. Ritchie F. C. Smith
HAKODATE	(*See* YOKOHAMA.)	
HALIFAX N.S.	*Ship and Engineer Surveyor* ... ... (TELEGRAMS, *Daile*)	J. P. Esdaile
*HAMBURG	*Ship Surveyors* ... ... (*Office, Steinhöft, No. 3, Hamburg 11,;* TELEGRAMS, *Dykes, Steinhöft*)	Geo. Dykes John Macdonald
	Engineer Surveyor (*Office, Admiralitatstrasse, 52;* TELEGRAMS, *Ingbert*)	†M. Berendt
	Assistant Engineer Surveyor	†J. Köhler

† Mr. Berendt and Mr. Köhler are not exclusively the Officers of Lloyd's Register.

*HARTLEPOOL, AND WEST HARTLEPOOL,	... ... *Ship Surveyors* (*Office, Central Buildings, West Hartlepool*)	J. Thomson, *Principal Surveyor.* R. Bennett O. Narbeth J. R. Henderson
	Ship and Engineer Surveyors	James Innes T. L. Thornton
*HAVRE	*Ship Surveyor* ... ... *Engineer Surveyor and Assistant Ship Surveyor* ... (*Office, 61, rue de la Bourse;* TELEGRAMS, *Lloyd's Register*)	M. G. Boyer A. Cartier
HELSINGFORS	*Ship and Engineer Surveyor* (TELEGRAMS, *Lloyd's*)	Hugo Lindfors
*HONG KONG	*Ship and Engineer Surveyor* (*Office, 5, Alexandra Buildings;* TELEGRAMS, *Marine*)	John Lambert
*HULL	*Ship Surveyors*... ... ... (*Office, Ocean Chambers, Lowgate, Hull*)	A. B. Wilson H. C. Farrar
	Ship and Engineer Surveyors	James Barclay J. Kerr
*IPSWICH	(*See* LONDON.)	
KIEL	*and other Ports in Schleswig-Holstein* (*See* HAMBURG).	
KOBÉ, HIOGO	*Ship and Engineer Surveyor* (*Office, 53, Harima Machi;* TELEGRAMS, *Ellerton*)	James Ellerton
KURRACHEE	*Ship and Engineer Surveyor* ... ... (*Address, Kutchery Road;* TELEGRAMS, *Hughes*)	J. Hughes

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

LEGHORN	... ... (*Address, Piazza Micheli, Leghorn;* TELEGRAMS, *A. Gori*)	Amerigo Gori
*LEITH	*Ship and Engineer Surveyors* ... ... (*Office, Royal Bank Buildings, 28, Constitution Street*)	G. A. Hake A. T. Graham
	Ship Surveyor	G. D. Aitken
LISBON	*Ship and Engineer Surveyor* ... ... (*Address, 7, T. do Caes do Tojo;* TELEGRAMS, *Enyap*)	George Payne
*LIVERPOOL	*Ship Surveyors* ... ... (*Office, 12, Oriel Chambers, Water Street;* TELEGRAMS, *Register*)	R. Williamson *Principal Surveyor.* J. Bradley S. A. G. Nash J. Petree W. H. Watson
	Engineer Surveyor, and Ship and Engineer Surveyors	R. Hirst W. Sibun H. H. Ashton C. I. Davidson J. Carnaghan
LÜBECK	(*See* HAMBURG.)	
LYTTELTON & CHRISTCHURCH, N.Z.	... ... (TELEGRAMS, *Willis*)	Stewart Willis
MALTA	*Ship and Engineer Surveyor* ... (*Office, 21, Strada Zaccaria, Valetta;* TELEGRAMS, *Register*)	C. H. Wright
*MANCHESTER	(*Office, 162, Trafford Road, Salford, Manchester;* TELEGRAMS, *Lloyd's Register, Trafford Road, Salford*) *Ship and Engineer Surveyors*	F. W. Pitt S. B. Freeman
MANILA, P.I.	*Ship and Engineer Surveyor* ... ... (*Address, 25, Plaza de Goiti, P.O. Box 307;* TELEGRAMS, *Turbine*)	William Swann
*MARSEILLES	*Ship and Engineer Surveyor* ... ... (*Office, 5, rue Suffren;* TELEGRAMS, *Jones*)	A. P. Jones
MAURITIUS	(*residing at Port Louis;* TELEGRAMS, *McDonald, Mauritius*)	M. S. McDonald
MELBOURNE, VICTORIA	*Ship and Engineer Surveyor* ... ... (*Address, New Zealand Chambers, 483, Collins Street;* TELEGRAMS, *Reports*)	Alexander McCowan
MESSINA	*and other ports in Sicily* (*See* NAPLES.)	
*MIDDLESBROUGH	*with Stockton* *Ship Surveyors* ... ... (*Office, Royal Exchange, Middlesbrough*)	W. H. Cooper, *Principal Surveyor.* W. L. Gilmour H. C. T. Ireland W. R. M. Aspinall R. D. Cairns
	Ship and Engineer Surveyors	G. A. Milner R. D. Shilston C. J. Hudson J. Harbottle S. N. Kent

MILFORD HAVEN	*Ship and Engineer Surveyor* (*Address, Point House, Llanstadwell, New Milford*)	J. W. Johnstone
MONTE VIDEO	(*See* BUENOS AYRES.)	
MONTREAL	(*Address, Port Warden's Office;* TELEGRAMS, *Portwarden*)	Archibald Reid
*NAGASAKI	*Ship and Engineer Surveyor* (*Address, 6, Minami Yamate;* TELEGRAMS, *Register*)	A. C. Heron
NANTES	*Ship and Engineer Surveyor* ... ... (*Office, 2, rue Racine;* TELEGRAMS, *Kerr, rue Racine*)	William Kerr
NAPIER, N.Z.	... . (TELEGRAMS,)	
NAPLES	*Ship and Engineer Surveyor* (*Residing at Torre Annunziata, near Naples;* TELEGRAMS, *Ducoster, Torrannunziata*)	Francesco Ducoster
NEW ORLEANS, LA.	(*Office, 806, Gravier Street;* TELEGRAMS, *Lawrie*)	Andrew Lawrie
*NEW YORK	*Principal Surveyor for the United States*	James H. Mancor
	Ship Surveyor	D. Nicholas
	Ship and Engineer Surveyor ... ... (*Office, Kemble Building, 15, Whitehall Street;* TELEGRAMS, *Nymdible*)	J. H. W. Marsden
NEWCASTLE, N.S.W.	... ... (TELEGRAMS, *Backstay*)	J. W. Vellacott
*NEWCASTLE-ON-TYNE	*Ship Surveyors* ... ... (*Office, Collingwood Buildings, Collingwood Street;* TELEGRAMS, *Register*)	E. C. Champness, *Principal Surveyor.* James McNeil A. Campbell-Holms Charles Skentelbery A. R. Sneddon S. O. Kendall G. O. Herbert C. M. Smith T. Shaw L. G. G. Demarest B. C. Laws A. P. W. McNab J. R. Dippie W. M. Ward R. Cheetham
	Engineer Surveyors, and Ship and Engineer Surveyors	J. H. Heck J. T. Findlay T. Field L. G. Shallcross G. A. D. Toyne A. E. Farminer W. Lane H. G. Dearden J. E. Sellex J. Robinson
	Inspector of Forgings	William Campbell
*NEWFOUNDLAND	... ... (*Address, 14, Gower St., St. John's;* TELEGRAMS, *Surveyor*)	George Wheatley

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*NEWPORT, MON.	... ... (*Office, Bank Chambers*) *Ship and Engineer Surveyors*	H. Clarke S. Townsend
	Ship Surveyor	G. L. Brown
*NEWPORT NEWS, VA.	(*See* BALTIMORE, MD.)	
ODESSA with NIKOLAIEFF	*Ship and Engineer Surveyor* (*Address, Chersonskaia*, 10, *Odessa;* TELEGRAMS, *Chersonskaia*, 10, *Odessa*) (*Acting also as Ship and Engineer Surveyor for Sebastopol*)	W. R. Skulte
OPORTO	*Ship and Engineer Surveyor* ... ... (*Office*, *49*, *Rua da Reboleira*; TELEGRAMS, *Ennor*)	Charles J. Ennor
ORKNEYS	... ... (*residing at Stromness*)	Geo. Gunn Baillie
PARA	*Ship and Engineer Surveyor* ... ... (*Office, Rua da Industria, No 46, Caixa 116;* TELEGRAMS, *Ward*)	John Ward
PENANG	*Ship and Engineer Surveyor* (TELEGRAMS,)	
*PHILADELPHIA, PA.	*Ship and Engineer Surveyor* ... ... (*Office*, *324*, *Bourse ;* TELEGRAMS, *Haig*)	R. Haig
PIRÆUS	*Ship and Engineer Surveyor* (TELEGRAMS, *Barnes*)	W. W. Barnes
*PITTSBURG, PA.	*For Steel Testing duties* (*Office, Westminster Apartments, Aiken Avenue, Pittsburg, Pa.*)	P. McGregor
*PLYMOUTH	*Ship and Engineer Surveyor* (*Office*, *13*, *Exchange*)	George Duncan
PORT ELIZABETH	... ... (*Address, Standard Bank Chambers, Main Street;* TELEGRAMS, *Gowan*)	William Gowan
PORT NATAL	(*Address*, *3*, *Castle Buildings, Durban;* TELEGRAMS, *Airth, Durban*)	Frederick Airth
PORT PIRIE, S.A.	... ... (*Address, Ellen Street ;* TELEGRAMS, *Mars*)	Alfred M. Mars
PORTLAND, OREGON	(*Office*, *80*, *Third Street;* TELEGRAMS, *Register*)	Lyddon Veysey
*PORTMADOC	(*Address, Eifion House, Portmadoc*)	John W. James
PRINCE EDWARD ISLAND	(*residing at Charlotte Town ;* TELEGRAMS, *Register*)	H. P. Welsh
QUEBEC	*Ship and Engineer Surveyor* (TELEGRAMS, *Samson*)	Joseph Samson
*QUEENSTOWN	... ... (*Address*, *1*, *Bellevue Terrace*)	H. W. Dove
RANGOON	(*Address, Lower Poozoondoung ;* TELEGRAMS, *Surveyor*)	R. P. Taylor
RIGA	*Ship and Engineer Surveyor* ... ... (*Address, Pychlau's Sagemuhle, Oscarstrasse, No. 7 ;* TELEGRAMS, *Surveyor*)	Eduard Buchholz
RIO DE JANEIRO	*Ship & Engineer Surveyor* (*Address, Caixa 686;* TELEGRAMS, *Register*)	Robert Vance

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

ROSARIO	(*See* BUENOS AYRES.)	
ROSTOCK	*and other Ports in Mecklenburg* (*See* HAMBURG.)	
*ROTTERDAM	(*Office, Veerhaven W.Z. 19, Rotterdam;* TELEGRAMS, *Lloyd's Register*)	W. F. D. Van Ollefen R. Leeuwenburg F N. Bernoski A. Schouwenaar
*ST. JOHN'S, N.F.L.	(*See* NEWFOUNDLAND.)	
SAN FRANCISCO, CAL.	*Ship Surveyor* ... ... *Engineer Surveyor* ... ... (*Surveyors' Office,* TELEGRAMS,	John Metcalfe W. H. Stewart
SEATTLE, WASH.	*Ship and Engineer Surveyor* ... ... (*Office, Mutual Life Building, 601, First Avenue, Corner Yesler Way ;* TELEGRAMS, *Lloyd's*)	James Fowler
SEBASTOPOL	(*See* ODESSA.)	
SEVILLE	*Ship and Engineer Surveyor* ... ... (*Office, Larana, 12;* TELEGRAMS. *Pina*)	José Pina
SHANGHAI	*Ship and Engineer Surveyor* ...(TELEGRAMS, *Paulsen*)	V. C. Paulsen
*SHEFFIELD	*Ship and Engineer Surveyors* ... ... (*Office, Orchard Chambers, Church Street*)	R. F. Morton J. H. Mackirdy
*SINGAPORE	*Ship and Engineer Surveyor*... ... ... (*Office,* 7E, *Battery Road ;* TELEGRAMS, *Webb*)	F. W. Webb
SOURABAYA	*Ship and Engineer Surveyor* ... ... (*Address, Goebeng ;* TELEGRAMS, *Lecomte, Engineer, Sourabaya*)	J. W. Le Comte
*SOUTHAMPTON	*Ship and Engineer Surveyors* ... ... (*Office, 3, Oriental Place*)	J. Dykes A. W. Murray
	Ship Surveyor	A. Munro
STETTIN	*Ship and Engineer Surveyor* (*Office, Bollwerk, 1*) ...	Emil Herzberg
STOCKHOLM	*Ship and Engineer Surveyor* ... ... (*Address, Skeppsmåtningskontoret, 34, Skeppsbron ;* TELEGRAMS, *Lloyd's Register*)	Albert Isakson
*SUNDERLAND	*Ship Surveyors* ... (*Office, 56, John Street*)	Thomas S. Warren, *Principal Surveyor.* George Harrison J. Allan T. S. Leathard T. S. Shute R. Howie
	Engineer Surveyor, and Ship and Engineer Surveyors	R. W. Coomber A. Boyd E. J. Stoddart
	Inspector of Forgings	F. Cook

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*SWANSEA	*Ship and Engineer Surveyors* (*Office*, 1, *Gloster Place*)	G. C. Vaux A. Campbell
*SYDNEY, N.S.W.	*Ship and Engineer Surveyor* (TELEGRAMS, *Miramar*)	R. Pollock
SYRA	*Ship and Engineer Surveyor* (TELEGRAMS, *Eyssartier*)	Edward Eyssartier
TACOMA, WASH.	(*See* SEATTLE.)	
TÖNNING	*and other Ports in Schleswig-Holstein* (*See* HAMBURG.)	
*TRIESTE	(*Office, Via San Giorgio 5;* TELEGRAMS, *Lloydregister, Sangiorgio, Trieste*) *Ship Surveyor* ... ... *Ship and Engineer Surveyor*	 Bernard J. Ives C. R. Hughes
	Engineer Surveyor for Steel Testing duties	A. von Purschka
VALPARAISO	*Ship and Engineer Surveyor* (*Address, Casilla, 934;* TELEGRAMS, *Smith, Pacific. Valparaiso*)	A. F. Smith
VANCOUVER CITY	*Ship and Engineer Surveyor* ... ... (*Address, corner of Seymour and Pender Streets (P. O. Box 642);* TELEGRAMS, *Register, Vancouver, B.C.*)	T. G. Mitchell
VEENDAM	(*See* AMSTERDAM.)	
WATERFORD	*Ship and Engineer Surveyor*	Andrew Horn
WELLINGTON, N.Z....	... ... (TELEGRAMS, *Bendall*)	William Bendall
WEXFORD	... ...	R. J. Sparrow
*WHITEHAVEN	(*See* BARROW.)	
*YOKOHAMA	*Ship and Engineer Surveyor* (*Office*, 23, *Water Street;* TELEGRAMS, *Register*)	A. S. Williamson
HAKODATE	*Assistant Ship and Engineer Surveyor*... ... ... (*Address*, 5, *Kaisho Machi;* TELEGRAMS, *Yamada, Kaishomachi*)	Sakuro Yamada

71, FENCHURCH STREET, LONDON.
June, 1906.

LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

Section 1. THE operations of the Societies of the two Register Books of Shipping formerly printed for the use of Merchants, Ship Owners, and Underwriters, having ceased in the year 1834, this Society was then established for the purpose of obtaining a faithful and accurate Classification of the Mercantile Shipping of the United Kingdom, and of the Foreign Vessels trading thereto, and for the government of which the following Rules and Regulations have been from time to time adopted.

Section 2. A Register Book to be printed annually for the use of Subscribers, containing the names of the Ships with other useful information, and the Character assigned, where the vessels are classed by the Society; also the names, &c., of all Ships of 100 tons and upwards unclassed by this Society.

Section 3. Each person subscribing the sum of Three Guineas per annum (or such other sum as the General Committee may fix) to be considered a Member of the Society, and entitled *for his own use* to one copy of the Register Book.

Section 4. The subscription of Marine Insurance Companies, Public Companies or Public Establishments to be Six Guineas per annum, for a single copy of the Register Book and £3 3s. per annum for every additional copy supplied, unless the copies be periodically posted with type with additions and corrections throughout the year, in which case the subscription for each copy supplied will be Ten guineas per annum.

Section 5. In the case of other Subscribers the subscription to be £3 3s. per annum for each copy, unless periodically posted with type with additions and corrections throughout the year, in which case the subscription will be £5 5s. per annum for each copy supplied.

Section 6. For the convenience of Subscribers not resident in London, or whose Register Books are not posted, a Supplement, containing the additions to, and corrections made in, the Register Book, to be printed fortnightly, in such convenient form as to admit of its transmission by Post, so that such parties may be furnished, from time to time, with the latest and most complete information.

Section 7. The superintendence of the affairs of the Society to be under the direction of a Committee of Merchants, Shipowners, and Underwriters : twenty-four elected in London and thirty-two at the principal Outports, and in addition, the Chairman, or, in his absence, the Deputy-Chairman of the Corporation of Lloyd's, and the Chairman, or, in his absence, the Deputy-Chairman of the General Shipowners' Society, for the time being, to be, *ex-officio*, Members of the Committee, but any member (except an ex-officio member) who fails to attend any meetings of the Committee for a period of six continuous months, without leave of absence, shall cease to be a member, and his place shall be filled up in the usual way.

NOTE.—Official intimation to be given in June of each year whether the Chairman or Deputy-Chairman of the Corporation of Lloyd's, or the General Shipowners' Society, respectively, are to be the ex-officio members for the ensuing twelve months.

Section 8. The General Committee reserve the right of varying or withdrawing the representation of Outports, also the representation of Shipbuilders, Engineers, and Steel Makers on the Technical Sub-Committee hereinafter mentioned, as well as the mode of election of Members.

Section 9. 1. Six of the Members elected in London, namely, two of each of the constituent parts of the Committee, to go out annually by rotation, but to be eligible to be re-elected. The vacancies so arising to be filled up by the election of two Underwriters and one Merchant by the Committee of Lloyd's, and two Shipowners and one Merchant by the Committee of the General Shipowners' Society.

2. Of the Members elected at the Outports twenty-eight are to retire at the end of every *four* years, and four of the Members elected at Liverpool are to retire annually. The retiring Members are eligible for re-election.

Section 10. The Committee to appoint from their own body, annually, a Chairman and Deputy-Chairman, and also a Chairman for a Sub-Committee of Classification.

Section 11. The Committee to appoint a Sub-Committee of Classification, to be so regulated that each Member of the General Committee may, in rotation, take his turn of duty therein throughout the year.

Section 12. The Secretary, Clerks, and Servants of the Society, and the Surveyors, to be appointed by and be under the direction of the General Committee.

Section 13. Special meetings to be convened by order of the Chairman, or Deputy-Chairman, or on the requisition of any three Members.

Section 14. All elections and appointments to be made by ballot, excepting when in the election of Chairman, Deputy-Chairman, or Chairman of Classification, only one person is nominated for each office.

Section 15. No Member of the Committee to be permitted to be present on the decision of the classification of any ship of which he is the owner, or wherein he is directly or indirectly interested.

Section 16. 1. The Committee to be empowered to make such Bye-laws for their own government and proceedings as they may deem requisite, not being inconsistent with the original Rules and Regulations under which the Society was established ; but no new Rule or Bye-law to be introduced, or any Rule or Bye-law altered, without special notice being given for that purpose at the Meeting of the

Committee next preceding that at which such Motion is intended to be made ; such notice to be inserted in the summons convening the meeting.

2. No new Rule, or alteration in any existing Rule materially affecting the classification of Ships, to be applied compulsorily to vessels of which the plans have been submitted and approved before the expiration of six months after the date when the change has been adopted.

Section 17. Twelve representatives of Shipbuilders and Engineers, and two representatives of Steel Makers shall join the Sub-Committee for Surveyors to form a Technical Sub-Committee, on all occasions when it is proposed to make alterations in the existing rules, or to frame new rules, for the construction of ships or machinery.

1. That twelve representatives of Shipbuilders and Engineers shall be elected by the following bodies, viz. :—

(*a*) The Institution of Naval Architects, London ;

(*b*) The Institution of Shipbuilders and Engineers of the North-East Coast of England, Newcastle-on-Tyne ; and

(*c*) The Institution of Engineers and Shipbuilders in Scotland, Glasgow,

two shipbuilders and two engineers being elected by each body ; and also

That two representatives of Steel Makers be elected by the Iron and Steel Institute, of whom one is to represent England and Wales and the other Scotland.

2. That the representatives shall be elected for terms of four years, but in the event of any vacancy occurring before the expiration of this period a representative may be elected to fill the vacancy for the unexpired portion of the term.

3. That those only who are actually partners in Shipbuilding, Engineering, or Steel Manufacturing Firms, or are Managers of Joint Stock Shipbuilding, Engineering, or Steel Manufacturing Companies shall be eligible for election.

4. That the Chairman of the Committee of Lloyd's Register of British and Foreign Shipping, for the time being, or, in his absence, the Deputy-Chairman ; or, failing him, some other member of the General Committee shall preside at the meetings of the Sub-Committee.

5. That the representatives of Shipbuilders, Engineers and Steel Makers shall have the same rights and powers as the other members of the Sub-Committee in speaking and voting at the meetings of the Sub-Committee at which they are entitled to be present.

6. That it shall be open to representatives of Shipbuilders, Engineers and Steel Makers to propose alterations in, or additions to, the Rules for the construction of ships or machinery ; and that notice of all such proposals shall be sent in writing to the Secretary.

7. That meetings of the Sub-Committee shall be convened as often and at such times as may appear necessary to the General Committee, but there shall be at least two meetings in the year, though not necessarily one in each six months.

8. That every meeting shall be convened by notice from the Secretary at least one month before the date of meeting ; that the meetings shall, whenever practicable, be arranged for Tuesday afternoons ; that notice of matters proposed to be brought before the Sub-Committee by members shall be sent to the Secretary not less than fourteen days before the meeting, and the Secretary shall, as soon as possible thereafter, send to each member an agenda paper.

9. That the recommendations of the Sub-Committee shall be reported to the General Committee, who will refer them for consideration to a Special Meeting of the General Committee, as required by Section 17 of the Rules.

10. That in the event of eight representatives of Shipbuilders, Engineers and Steel Makers actually voting together on any question, and nevertheless failing to obtain a majority of the Sub-Committee, it shall be open to them to present a minority report to the General Committee.

11. That the General Committee reserve to themselves the right of varying, adding to, or rescinding, at their discretion, any or all of the foregoing Rules.

Section 18. All Reports of survey to be made in writing by the Surveyors according to the form prescribed, and submitted for the consideration of the General Committee, or of the Sub-Committees of Classification; but the character assigned by the latter to be subject to confirmation by the General Committee.

Section 19. 1. The reports of the Surveyors, and all documents and proceedings relating to the classification of ships are to be carefully preserved and to be open to the inspection of the Owners, but no other person or persons are to have access to such documents except with the written consent of the Owners and under the direction of the Chairman or Deputy-Chairman.

2. Copies of the original reports (if the ships be already classed, but not otherwise), so far as relates to the dimensions, scantlings, fastenings, and materials, in cases where the correctness of the reports in these particulars is certified by the builders, are granted on application.

Section 20. Foreign ships, and ships built in the British possessions abroad where there is not a Surveyor (*see also* Section 52 of the Rules for Wood Vessels), to be surveyed on their arrival at a port to which a Surveyor has been appointed; but a due regard is to be had to the circumstance of such vessels having been exempted from supervision while building, and the Character to be assigned to them is to be regulated according to their intrinsic quality and from the best information the Committee can obtain.

Section 21. In every case in which the Character assigned to a ship may be proposed, on survey, to be reduced, notice is to be given in writing to the Owner, Master, or Agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, on the Owner, Master, or Agent agreeing to pay the expenses attending the same, provided on the said survey there shall appear sufficient ground for the proposed reduction.

Section 22. 1. When the Surveyors consider repairs to be requisite, they are respectfully to communicate the same in writing to the Owner, Master, or Agent, and if such repairs be not entered upon within a reasonable time, a corresponding report is to be made, as soon as possible, to the Committee for their decision thereon.

2. All repairs of Ships or Machinery required at Ports where there is a Surveyor to this Society, in order to their obtaining a Character in the Register Book, or to their retaining the Characters assigned to them therein, must be carried out under the inspection, and to the satisfaction of the Society's Surveyors. Ships or machinery repaired at Ports where there is no Surveyor to this Society must be surveyed by one of the Society's Surveyors at the earliest opportunity.

Section 23. Parties considering the repairs suggested by the Surveyor to be unnecessary or unreasonable may appeal to the Committee, who will direct a special survey to be held; but should the opinion of the Surveyor be confirmed by the Committee, then the expense of such special survey is to be paid by the party appealing.

Section 24. The Surveyors to the Society not to be permitted (without the especial sanction of the Committee) to receive any fee, gratuity, or reward whatsoever for their own use or benefit, for any service performed by them in their capacity of Surveyors to this Society, on pain of immediate dismissal.

Section 25. The Surveyors will be directed to attend on Special Surveys of ships or machinery while building or under damage or repair, when required by Merchants, Shipowners, or Underwriters; the charge for which is to be regulated according to the nature and extent of the service performed. In all cases, the application for the assistance of the Surveyors must be made in writing addressed to the Secretary.

FUNDS.

Section 26. The Funds to be under the authority and control of the Committee, and a statement of the Receipts and Expenditure to be annually printed for the information of the subscribers.

Section 27. The following Fees to be charged to the Owners of ships prior to their vessels being classed and registered in the book:—

Classing Fees.

For First Entry of Class in the Register Book.

For each Ship under 200 Tons	£1	0	0
Ditto of 200 and under 500 Tons	2	0	0
Ditto of 500 „ 1,000 „	3	0	0
Ditto of 1,000 „ 2,000 „	4	0	0
Ditto of 2,000 and upwards	5	0	0

For First Entry of Notification "LMC" in the Register Book.

For each Ship under 100 nominal HP.	£1	0	0
Ditto of 100 and under 300 HP.	2	0	0
Ditto of 300 and above	3	0	0

SPECIAL SURVEYS.

Section 28. 1. For ships built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠), 1s. per ton for the first 1,000 tons, and 6d. per ton for every ton beyond 1,000 tons. No fee, however, shall be less than £7 0*s.* 0*d.*

2. For machinery or new boilers built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠ in red):—

3. For engines and boilers up to 200 horse-power, 3 shillings per horse-power. For engines over 200 horse-power, 3 shillings for the first 200 horse-power, and 1 shilling per horse-power above 200. No fee to be less than £8 0s. 0d.

4. The following rule is to be used for determining the Nominal Horse Power of Engines in regulating the fees for their survey, viz. :—

$$\text{NHP}=\frac{\text{P}+340}{1000}\left(\frac{\text{D}^2\sqrt{\text{S}}}{100}+\frac{\text{H}}{15}\right) \text{ where the boiler pressure is below 160 lbs.}$$

$$=\frac{\text{P}+590}{1500}\left(\frac{\text{D}^2\sqrt{\text{S}}}{100}+\frac{\text{H}}{15}\right) \text{ where the boiler pressure is 160 lbs. or above.}$$

If the boilers are fitted with Forced Draught or Induced Draught appliances, then $\frac{\text{H}}{12}$ is to be taken instead of $\frac{\text{H}}{15}$.

where D = diameter of L.P. Cylinder in inches.

S = stroke in inches.

H = heating surface in square feet.

P = working pressure in lbs. per square inch.

The square feet of heating surface represented by H will comprise the surfaces of the tubes, of the back tube plate or plates, and of the furnace and combustion chamber plating down to the level of the fire bars.

5. For the survey and testing of each Donkey Boiler, a fee of two guineas be charged.

6. No charge will be made for occasional or docking surveys, or for surveying repairs consequent on ordinary wear and tear, at ports in the United Kingdom.

For the survey of damage repairs essential to the continuation of class (whether a special damage report be required or not), for surveys with a view to the re-instatement of class, and for the survey of alterations in the structure of a vessel, a fee will be charged according to the nature and extent of the services performed.

For all surveys held at Foreign ports a fee will be chargeable according to the nature and extent of the services rendered.

7. **SPECIAL PERIODICAL SURVEYS, Nos. 1, 2, and 3.**

For the special periodical surveys of Iron and Steel Vessels, when such surveys are held by the Society's exclusive Surveyors in the United Kingdom.

	S.S. No. 1.	S.S. No. 2.	S.S. No. 3.
	£ s.	£ s.	£ s.
For Vessels under 150 tons gross ...	1 0	... 1 10	... 3 0
" " 200 " ...	1 10	... 2 0	... 3 10
" " 250 " ...	2 0	... 2 10	... 4 0
" " 300 " ...	2 10	... 3 10	... 4 10
" " 400 " ...	3 0	... 4 0	... 5 0
" " 800 " ...	3 10	... 4 10	... 6 0
" " 1,200 " ...	4 0	... 5 0	... 7 0
" " 1,800 " ...	4 10	... 5 10	... 8 0
" " 2,500 " ...	5 0	... 6 0	... 9 0
" " 3,500 " ...	5 10	... 6 10	... 10 0
" of 3,500 " and above	6 0	... 7 0	... 10 0

SPECIAL PERIODICAL SURVEYS OF MACHINERY.

Held at the Special Surveys, Nos. 1, 2, and 3.

For each Ship under 50 nominal HP.	£2	0	0
" " 75 "	2	10	0
" " 100 "	3	10	0
" " 150 "	4	0	0
" " 200 "	4	10	0
" " 300 "	5	0	0
" of 300 " and above	5	10	0

SPECIAL ANNUAL SURVEYS OF BOILERS.

To be held when and after the Boilers are six years old.

For each Ship having 1 boiler	£1	0	0
And for each additional boiler (including the donkey boiler) ...	0	10	0
But the fee in no case to be more than	3	0	0
For survey of donkey boiler of sailing vessels	1	0	0

8. For Surveys for Restoration, Continuation, or the character A in Red, and in cases where the caulking of ships is superintended and tested by the Surveyors a charge will be made according to the nature and extent of the services rendered.

9. All repairs which may be required on the Surveys above referred to, must be performed under the superintendence of the Society's Surveyors. (*See also* Section 22.)

MEM.—It is to be understood that in all cases where travelling expenses are incurred by the Surveyors in connection with the above services, they are to be defrayed by the parties interested in the same.

Section 29. The class of a vessel is liable to be withheld, or, if already granted, may be withdrawn or expunged from the Register Book in the case of non-payment of any fees or expenses chargeable on account of such vessel.

Section 30. Certificates of Character, on the Form No. 7, or of "LMC," or "B&MS," on Forms Nos. 10 or 11, signed by the Chairman, the Deputy-Chairman, or the Chairman of the Sub-Committee of Classification, and countersigned by the Secretary, will be granted on application.

FREEBOARD.

Section 31. Fees for the Survey for, and assignment of, Freeboard to vessels :—

For Classed Vessels under 300 tons gross	£1	1	0
" " of 300 tons and under 1000 tons gross	2	2	0
" " 1000 " " 2000 "	3	3	0
" " 2000 " " 3000 "	4	4	0
" " 3000 " " 4000 "	5	5	0
" " 4000 " and above	6	6	0

Section 31a. Rules for Steel Ships, 5s. If for Wood Ships and Composite Ships, 5s.

LONDON, *15th December, 1904.*

GENERAL REGULATIONS

RELATING TO THE

CLASSIFICATION OF STEEL VESSELS.

1. Classification. 1. *General.*—Steel vessels built in accordance with the Society's Rules and Regulations, or with alternative arrangements equivalent thereto, will be classed 100A or 90A so long as they are found, upon careful annual and periodical survey, to be in a fit and efficient condition for the safe conveyance of dry and perishable cargoes. Vessels which do not fulfil the requirements for the 100A class, but which exceed the requirements for the 90A class, may, if the Committee approve, be classed 95A. The numerals prefixed to the letter A do not signify terms of years, but indicate grades of classification.

Deviations from the Rules will be allowed, provided they are submitted to the Committee and considered by them to be equivalent to the requirements of the Rules. The builder is required to obtain the owners' sanction to such deviations, when the Committee deem it to be necessary.

2. *Classes for Special Trades.*—Vessels which are intended for special trades or purposes, and which are considered by the Committee to be fit for the contemplated employment, will be classed A without a numeral prefixed, provided all the details of the proposed scantlings and arrangements are submitted to the Committee and approved by them, and provided the Rules are otherwise complied with. To the class A, in such cases, will be affixed notations showing the particular trades or purposes for which the vessels are intended, thus :- A "For river purposes only"; A "For tug purposes"; A "Fishing Smack"; A "For channel purposes"; &c. In the cases of vessels intended for channel purposes, the particular channel will be defined thus: "Bristol Channel," "Irish Channel," "English Channel," "Newhaven—Dieppe," &c.

3. *Vessels classed "with freeboard."*—In the cases of awning-decked steamers and channel steamers, and, in such other cases as the Committee may consider necessary, it is a condition of classification that a minimum freeboard shall be submitted to and approved by the Committee. In such cases the words "with freeboard" will be inserted under the character in the certificates of class and in the Register Book, and the freeboard must be marked on the vessel's sides in the manner shown by the diagrams printed at the end of the Rules.

Whenever the character of a vessel to which a minimum freeboard has been assigned as a condition of classification is for any reason withdrawn or expunged from the Register Book, the record of freeboard will be omitted on the next reprint of the Register Book, unless the character has been previously reinstated.

2. Submission of Plans.—In all cases in which it is intended to build vessels for classification in the Register Book, sketches of midship section and profile, with deck and other plans,

showing the proposed dimensions, scantlings and arrangements, must in the first place be submitted by the builders through the local Surveyors, for the approval of the Committee.

3. Special Survey during construction.—Vessels intended for classification in the Register Book are to be built under the Society's Special Survey, and vessels so built will be entitled to the distinctive mark ✠ in the Register Book.

During the progress of construction, from the laying of the keel to the completion of a vessel, it is the duty of the Surveyors to examine the material and workmanship in order to ensure that the requirements of the Rules and the approved plans are satisfactorily carried out. The Surveyors are required to point out as early as possible anything that is objectionable, or that is not in accordance with the Rules or with the plans approved by the Committee for the particular vessel.

4. Vessels not built under Survey.—The requirements of the Committee in cases in which it may afterwards be desired that vessels which have not been built under the Society's survey should be assigned classes in the Register Book are set forth on page 106.

5. Engines and Boilers. 1. *General.*—The engines and boilers of steam vessels intended for classification, or already classed, in the Register Book, must be constructed under the Society's Special Survey. Appropriate records will be made in the Register Book in red ink, as follows, viz. :—"✠LMC. 7,06 (Lloyd's Machinery Certificate, July, 1906) ; ✠N.E.&B 7,06 (New Engines and Boilers, July, 1906) ; ✠N.E. 7,06 ; or ✠N.B. 7,06. The requirements relating to the construction and survey of engines and boilers, are set forth at pages 109 to 124.

2. *Novel Types, &c.*—In cases in which the engines or boilers are of novel description, or in which experience has not sufficiently shown the safety of the principle or mode of application involved, the words "Machinery Experimental," or "Boiler Experimental," will be inserted under the class of the vessel in the Register Book ; but if, in the opinion of the Committee, the engines or boilers are so far inefficient as to imperil the vessel's safety, no class will be assigned.

6. Equipment.—The figure 1 placed after the character assigned to a vessel, thus :- 100A1 will denote that the vessel's equipment is in good and efficient condition and otherwise in accordance with the requirements of the Rules. In cases in which the requirements of the Rules as to equipment have not been complied with, or in which the equipment is found to be insufficient in quantity or defective in quality, a line will be inserted in place of the figure 1, thus :- 100A—.

7. Date of Build.—In all cases of vessels built under special survey, the date of the completion of such survey will be taken as the date of build of the vessel, provided the survey be completed within six months of the date of launching for vessels under 10,000 tons gross, nine months for vessels of 10,000 tons and under 20,000 tons gross, and twelve months for vessels of 20,000 tons gross and upwards. When, however, the special survey is not completed within the period allowed, the date of build will be taken as six, nine, or twelve months after the date of launching, as the case may be.

8. Periodical Special Surveys. 1. *General.*—To entitle steel vessels to retain the characters assigned to them in the Register Book, they are required to be subjected to the Periodical

Special Surveys, designated No. 1, No. 2, and No. 3 (the requirements for which are set forth at pages 38 to 42). These surveys severally become due, in the cases of vessels classed from 100A to 90A inclusive, at 4 years, 8 years, and 12 years respectively from the date of build, and subsequently at the expiration of like periods from the date recorded in the Register Book of the previous Special Survey No. 3. Should a vessel at any time be submitted to Special Survey No. 3 before being 12 years old, the Special Surveys subsequently required will be Nos. 1, 2 and 3, at 4 years, 8 years, and 12 years, respectively from the date recorded in the Register Book of such Special Survey No. 3.

2. *Vessels classed for special trades.*—Vessels classed A for special purposes are required to be subjected to Special Surveys Nos. 1, 2, and 3 (the requirements for which are set forth at pages 38 to 42), at 3 years, 6 years, and 9 years, respectively, from the date of build, and at the expiration of like periods from the date recorded in the Register Book of the previous Special Survey No. 3.

3. *Surveys held in anticipation.*—In cases in which it may suit the convenience of the owners, the Special Surveys Nos. 1 and 2 may be held at any time within twelve months previous to the dates at which they severally become due, and the Special Survey No. 3 may be held at any time before the date at which it becomes due.

4. *Period allowed for completion of surveys.*—In cases in which it is inconvenient to owners to fulfil all the requirements of either of the Periodical Special Surveys at the prescribed time, part only of the survey need be then carried out, provided the remainder of the survey be completed within twelve months from the date at which it became due. When a special survey is only partly held, the Surveyors must give the owners or their agents written notice of the parts not surveyed, and report the facts to the Committee.

5. *Record of Periodical Special Surveys in Register Book.*—Vessels which have satisfactorily passed any of the Periodical Special Surveys will have notations made against their names in the Register Book indicating the survey and the date at which it was held thus :—*ss*No.1-06, *ss*No.2-06, *ss*No.3-7,06, 2nd*ss*No.3-7,06. In cases in which Special Surveys are not completely carried out at one time, the date of Special Survey recorded in the Register Book will be the date of the survey at which the principal part of the requirements are complied with.

6. *Engines and Boilers.*—Particulars of the requirements for, and of the records made in the Register Book concerning, the periodical survey of the engines and boilers of steam vessels, and of the donkey boilers of sailing vessels, are set forth at pages 124 and 125.

9. Occasional Surveys.—All vessels are subject to Annual, or Occasional, Surveys when practicable. The requirements in respect of such surveys are set forth at page 43.

10. Survey of Repairs.—All repairs of vessels, engines and boilers that may be required at ports where there is a Surveyor to the Society, in order that the vessels may retain their characters in the Register Book, must be carried out under the inspection and to the satisfaction of the Society's Surveyor. When such repairs are effected at a port where there is no Surveyor to this Society, the vessel must be surveyed by one of the Society's Surveyors at the earliest opportunity.

When the Surveyors consider repairs to be requisite, they are respectfully to communicate the same in writing to the owner, master, or agent; and, if such repairs be not entered upon within a reasonable time, a corresponding report is to be made, as soon as possible, to the Committee for their decision thereon.

11. Notice of Surveys.—Whilst the Society's Surveyors are required to attend for the purpose of holding surveys in their district, the duty of giving notice when the attendance of the Surveyors is required to carry out Periodical Special Surveys or to supervise repairs rests with the owners, master or agents. If such notice is not given and the requisite surveys are not carried out, the characters of vessels are liable to be expunged from the Register Book.

12. Appeal from Surveyor's recommendations.—Interested parties considering the recommendations of the Society's Surveyors, as to the construction or repair of a vessel, to be in any case unnecessary or unreasonable, are entitled to appeal to the Committee, who will direct a special survey to be held; but should the opinion of the Surveyor be confirmed by the Committee, the expense of such special survey is to be paid by the party appealing.

13. Certificates of Class. 1. *General.*—Certificates of first entry of classification, and certificates of character upon subsequent completed surveys on vessels, engines, and boilers, signed by the Chairman, the Deputy-Chairman, or the Chairman of the Sub-Committees of Classification, and countersigned by the Secretary, will be granted on application.

2. *Provisional Certificates.*—If the hull of a steamer has been built in accordance with the Rules and a satisfactory report has been received from the Society's Surveyors, a provisional certificate will be issued, if desired, stating the class to which the vessel will be entitled when the engines and boilers have been fitted on board in accordance with the Rules, and the Committee's requirements otherwise complied with.

14. Reconsideration of Class.—If, upon survey of any vessel, material reduction is found to have taken place in the thickness of the plating and angles, the classification of the vessel will be reconsidered by the Committee. In every case in which the class assigned to a vessel is proposed to be reduced, notice is to be given in writing to the owner, master, or agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, if the owner, master, or agent agrees to pay the expenses attending the same, provided on the said special survey there shall appear sufficient ground for the proposed reduction.

15. Withdrawal of Class. 1. *Non-compliance with Rules.*—When the Rules as regards surveys on the hull, engines or boilers of a steam vessel, or on the hull, masts, spars, or rigging of a sailing vessel have not been complied with, so that the vessel is not entitled to retain her class in the Register Book, the character will be expunged with a red line, under which the date of such withdrawal of class will be recorded.

SCANTLINGS.

Section 2. 1. The scantlings and spacing of the frames, reversed frames, and floor-plates, and the thickness of bulkheads in Table S 1 are regulated by numbers, which are produced as follows :—

2. **For one and two-decked vessels.**—The number is the sum of the measurements in feet arising from the addition of the half-moulded breadth of the vessel at the middle of the length, the depth from the upper part of the keel to the top of the upper deck beams, with the normal round-up, and the girth of the half midship frame section of the vessel, measured from the centre line at the top of the keel to the upper deck stringer plate.

3. **For "Three-deck" steam vessels.**—The number is produced by the deduction of 7 feet from the sum of the measurements taken to the top of the upper deck beams. (*See* Section 41.)

4. **For Spar-decked vessels and Awning-decked steam vessels.**—The number is the sum of the measurements in feet taken to the top of the main deck beams, as described for vessels having one or two decks. (*See* Sections 42 and 43.)

5. The scantlings of the keel, stem, stern-frame, keelson, and stringer plates, the thickness of the outside plating and deck ; also the scantlings of the angle bars on beam stringer plates, and keelson and stringer angles in hold, as in Tables S 2, S 3, S 3A, S 5, and S 7, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

6. In vessels of exceptional fineness of form, intended for passenger traffic, or to carry a limited amount of cargo with a fixed freeboard, a modification in the scantlings will be admitted, subject to all particulars being submitted by the Builders, and the deviations from the scantlings required by the rules being sanctioned by the Owner.

7. **For Turret deck vessels. Dimensions.**—The length and breadth are to be measured as described in paragraphs 5, 6 and 7 of Section 1, but the depth is to be taken at the middle line from the upper part of the keel to the top of a normal beam line drawn through the point where a vertical line at the quarter breadth of the vessel cuts the upper surface of the vessel's deck, or where it cuts the upper surface continued in cases where the turret is nearly one-half the breadth of the vessel and its transverse section is of rounded form at the base. (*See* sketch A page 149.)

8. For turret deck vessels under 24 feet in depth the first number for scantlings shall be the periphery in feet of the half midship section measured on the outside of the frames and the upper side of harbour deck beam.

9. For turret deck vessels which are 24 feet in depth and above, the transverse number may be reduced by 14 feet.

10. In turret deck vessels having no sheer the first number for scantlings may be reduced by three-fourths of the standard mean sheer as set forth in the Freeboard Tables for a length equal to twelve times the moulded depth of the vessel measured at side from top of normal beam line at base of turret.

11. The radii of curvature at the gunwale and base of turret are to be from 15 to 25 per cent. and 10 to 20 per cent. respectively of the moulded depth.

12. The second number for scantlings is to be obtained by multiplying the first number by the length of the vessel. (*See* sketch B pages 150 and 151.)

13. The main sheerstrake required by the Rules is to be fitted at the turret deck and the remainder of the outside plating, including the harbour deck, is to be of the thickness required for the corresponding plating number by Table S 2.

14. Where the length of the vessel exceeds eleven times the depth, additional strength will be required as shown in Table S 6. The depth for proportions is to be taken as the depth from keel to harbour deck at centre line plus the percentage of height of turret that the breadth of turret bears to the breadth of the vessel, but the number of steel decks is not to be less than required by Table S 5 for a three deck vessel of the same dimensions.

QUALITY AND TESTING OF SHIP STEEL.

Section 3. 1. **Process of Manufacture.**—Steel for Shipbuilding shall be made by the Open Hearth process, acid or basic.

2. **Freedom from Defects.**—The finished material shall be free from cracks, surface flaws, and lamination. It shall also have a workmanlike finish, and must not have been hammer-dressed.

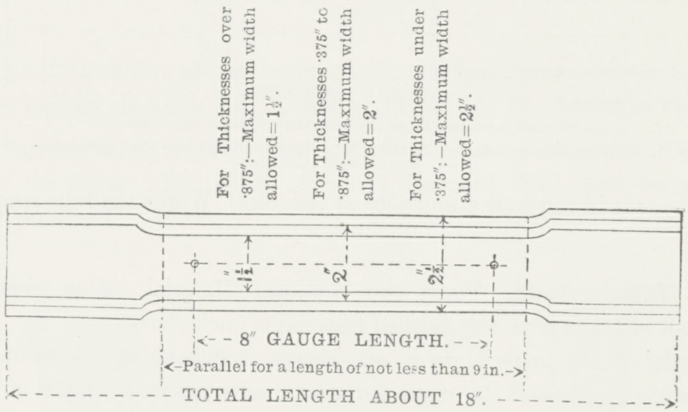
3. **Testing and Inspection.**—The following tests and inspections shall be made at the place of manufacture prior to despatch; but, in the event of any of the material proving unsatisfactory in the course of being worked into vessels, such material shall be rejected, notwithstanding any previous certificate of satisfactory testing, and such further tests of the material from the same charge may be made as the Surveyor may consider desirable.

4. **Tensile Test Pieces.**—The tensile strength and ductility shall be determined from Standard test pieces cut lengthwise or crosswise from the rolled material. When material is annealed or otherwise treated before despatch, the test pieces shall be similarly and simultaneously treated with the material before testing.

Plates:—Wherever practicable the rolled surfaces shall be retained on two opposite sides of the test piece. The elongation shall be measured on a Standard test piece having a gauge length of 8 inches.

For material more than ·875 in. in thickness the width of the test piece between the gauge points shall not exceed $1\frac{1}{2}$ ins.; for material ·875 in. to ·375 in. in thickness, inclusive, the width shall not exceed 2 ins.; for material less than ·375 in. in thickness the width shall not be more than $2\frac{1}{2}$ ins. In other respects the test pieces shall conform generally to the Standard test piece A.

TEST PIECE A.



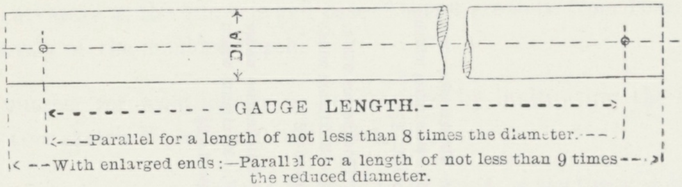
Any straightening of test pieces which may be required shall be done cold.

5. **Mechanical Tests, and Selection of Test Pieces.**—Plates and bars for shipbuilding shall comply with the following mechanical tests. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

6. **Tensile Tests.** Plates :—The tensile breaking strength of steel plates, determined from Standard test pieces, shall be between the limits of 28 and 32 tons per square inch. For plates specially intended for cold flanging and marked for indentification the lower limit shall be 26 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation, measured on a Standard test piece having a gauge length of 8 ins., shall not be less than 20 per cent. for material of ·375 in. in thickness and upwards, and not less than 16 per cent. for material below ·375 in. in thickness.

Angles, Bulb Angles, Channels, etc. :—The tensile breaking strength of sectional material, such as angles, bulb angles, channels, etc., shall be between the limits of 28 and 33 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation measured on a Standard test piece having a gauge length of 8 ins., shall not be less than 20 per cent. for material of ·375 in. in thickness and upwards, and not less than 16 per cent. for material below ·375 in. in thickness.

Rivet Bars :—The tensile breaking strength of rivet bars, when required by the Committee to be tested, shall be between the limits of 25 and 30 tons per square inch of section, with an elongation of not less than 25 per cent. of the gauge length of eight times the diameter of the test piece, measured on the Standard test piece B. The bars may be tested the full size as rolled.



When the Surveyor is in constant attendance at the Steel Works the following requirements are to be complied with :—

7. **Number of Tensile Tests.** Plates and Sectional Material :—One tensile test for plates or sectional material shall be taken from the finished material of each charge.

When the quantity of the material from one charge exceeds 25 tons, a second tensile test will be required ; also additional tests shall be made for every variation in thickness of ·15 of an inch in the plates or sectional bars from each charge.

Rivet Bars :—When required by the Committee to be tested, one tensile test shall be taken from each charge used for rivet bars ; but when the weight of the bars, as rolled, from one charge exceeds 10 tons, an additional tensile test shall be made for each further 10 tons or portion thereof.

Should a tensile test piece break outside the middle half of its gauge length, and the elongation be less than that required by the Rules, the test may, at the Maker's option, be discarded and another test be made of the same plate or bar.

8. **Bend Tests.**—Cold Bends :—Test pieces shall be sheared lengthwise or crosswise from plates or bars, and shall not be less than $1\frac{1}{2}$ ins. wide, but for small bars the whole section may be used. For rivet bars bend tests are not required.

Temper Bends :—The test pieces shall be similar to those used for cold bend tests. For temper bend tests the samples shall be heated to a blood red and quenched in water at a temperature not exceeding 80 degrees Fahr. The colour shall be judged indoors in the shade.

In all cold bend tests, and in temper bend tests on samples ·5 in. in thickness and above, the rough edge or arris caused by shearing may be removed by filing or grinding, and samples 1 in. in thickness and above may have the edges machined, but the test pieces shall receive no other preparation. The test pieces shall not be annealed unless the material from which they are cut is similarly annealed, in which case the test pieces shall be similarly and simultaneously treated with the material before testing.

For both cold and temper bends the test piece shall withstand, without fracture, being doubled over until the internal radius is equal to $1\frac{1}{2}$ times the thickness of the test piece, and the sides are parallel.

For small sectional material these bend tests may be made from the flattened bar.

Bend tests may be made either by pressure or by blows.

9. **Number of Bend Tests.**—A cold or temper bend test shall be made from each plate or bar as rolled, and these tests shall be in about equal numbers from each charge ; but a cold bend test shall be made from all plates which are specially marked for cold flanging.

10. **Tests for Manufactured Rivets.**—Rivets selected by the Surveyor from the bulk shall withstand the following tests :—

(*a*) The rivet shanks are to be bent cold, and hammered until the two parts of the shank touch in the manner shown in Fig. 1, without fracture on the outside of the bend.

(*b*) The rivet heads are to be flattened, while hot, in the manner shown in Fig. 2, without cracking at the edges. The heads are to be flattened until their diameter is $2\frac{1}{2}$ times the diameter of the shank.

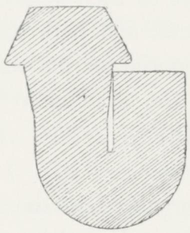


FIG. 1.

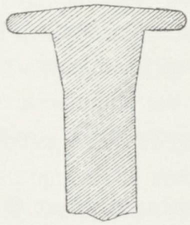


FIG. 2.

11. **Additional Tests before Rejection.**—Should any of the test pieces first selected by the Surveyor not fulfil the test requirements, two further tests may be made from the same plate or bar, but should either of these fail, the plate or bar from which the test pieces were cut shall be rejected. In all such cases further tests shall be made before any material from the same charge can be accepted.

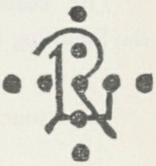
12. **Branding.**—Every plate and bar shall be clearly and distinctly marked by the Maker in two places with the Society's brand, thus :— indicating that the material has complied with the Society's tests.

No plates or bars bearing this brand shall be forwarded from the Steel Works until the prescribed tests have been made by the Surveyor, and the mill sheets have been signed by him. All plates and bars shall also be legibly stamped in two places with the Maker's name or trade mark and the place where made. They shall also be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

13. **Maker's Certificate.**—Before the mill sheets are signed by the Surveyor the Maker shall furnish him with a certificate guaranteeing that the material has been made by the Open Hearth process, and that it has been subjected to, and withstood satisfactorily, the tests above described in the presence of the Surveyor. The following form of certificate will be accepted if printed on each mill sheet with the name of the firm, and initialled by the Test House Manager :—

"We hereby certify that the material described below has been made by the Open Hearth process, and is that which has been satisfactorily tested in the presence of the Surveyor in accordance with the Rules of Lloyd's Register."

14. **Rejected Material.**—In the event of the material failing, in any case, to withstand the prescribed tests, the Surveyor shall see that the Society's brand stamped on the plates and bars by the Maker has been defaced by punch marks extending beyond the brand in the form of a cross, thus :—



denoting that the material has been rejected.

15.—**Facilities for Inspection.**—The Maker shall adopt a system of marking the ingots, billets, slabs, plates, bars, etc., which will enable all finished material to be traced to the original charge, and the Surveyor must be given every facility for tracing all plates and bars to their respective charges, and for witnessing the required tests. When he is satisfied with the material and with the results of the tests, he shall be furnished with two copies of the advice notes of the material for his signature, one of which is to be forwarded by the Manufacturer to the Shipbuilder, and the other is to be forwarded by the Surveyor to the Surveyors at the port where the vessel is to be built.

16. **Steel not produced where Rolled.**—Where steel is not produced in the works at which it is rolled, a certificate shall be supplied to the Surveyor stating the Open Hearth process by which it was made, the name of the Steel Maker who supplied it, also the numbers of the charges, for reference to the books of the Steel Maker. The number of the charge shall be marked on each ingot or billet for the purpose of identification, and the finished plates and bars shall also be legibly stamped in two places with the maker's name or trade mark and the place where made. They shall also be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

17. **Occasional Attendance at Steel Works.**—When the Society's Surveyor is not in constant attendance at the Steel works, the Makers themselves may, with the written authority of the Society, comply with all the foregoing requirements, and shall furnish the Surveyor with a certificate to the effect that the Society's Rules as to the testing of steel have been complied with in the case of the material submitted for approval. The Surveyor shall then make check tensile, cold, and temper bend tests from not less than one plate or bar in every batch of 50 or less number, provided the batch be all from one charge. If more than one charge is represented, each charge shall be tested. Additional tests shall also be made for every variation in thickness of ·15 of an inch made from one charge. The test pieces shall be selected by the Surveyor from the plates or bars, and not from shearings previously detached from them, and when marked by the Surveyor for testing they shall be followed, as far as practicable, through the different stages of preparation until the tests are completed.

Should the tests be unsatisfactory, the whole of the material from the charge shall be rejected, and the Surveyor shall see that the Society's brand is satisfactorily defaced.

18. **General.**—Besides the foregoing tests, samples of all material may be subjected to additional tests at the discretion of the Surveyors.

(*For List of Steel Manufacturers see page* 144.)

WORKMANSHIP.

Section 4. 1. The workmanship to be well executed, and submitted to the closest inspection, and amended where necessary before coating or painting : it is not, however, intended to prevent the coating of the plates inside in the way of the frames.

2. The black oxide or "millscale" *must* be removed from the surfaces before coating or painting, which should be delayed as long as possible.

3. Experience has also shown that, as regards durability, it is highly desirable to place steel vessels in dry dock within a reasonably short time after being launched, for the purpose of cleaning and re-coating the bottom.

4. Stringer plates, sheerstrakes, garboard strakes, and all buttstraps, when above $\frac{10}{20}$ of an inch in thickness, are to be carefully annealed, or the holes sufficiently rimed after punching, to remove the injurious effect of the punching.

KEEL, STEM, STERN AND PROPELLER POSTS, AND TRANSOMS.

Section 5. 1. The keel, stem, stern, and propeller posts are to be either scarphed or welded together, and to be in size according to Table S 2 ; if scarphed, the length of scarphs to be nine times the thickness given in the Table ; and the rivet-holes required in the *thin* ends of them are to be drilled after the scarphs are fitted.

2. Where the garboard strakes are thicker than required by the Rules, the thickness of the keel may be proportionately reduced.

3. Where the keel and keelsons are made of several thicknesses of plates, their combined thickness to be the same as is required for a solid keel, as per Table S 2 ; and the butts of the several plates of which the keel is formed to be carefully shifted from each other.

4. When **Hollow or Flat Plate Keels** are adopted, their breadth and thickness are to be as given in Table S 2 ; and the strake of plating on each side adjoining the flat plate keel to be of the thickness required for the garboard strakes in the Table. Where the number is 26,000 and above, the flat-plate keel to be doubled for one half the vessel's length amidships.

5. Where flat plate keels are used, intercostal keelson plates, or vertical centre-plates, must be fitted close down on the keel, and connected to it by double angles of the dimensions given for keelson angles in Table S 3, riveted all fore and aft to the keel and keelson. For flat keel angles in double bottoms see Table S 7. (*See also* Section 9, paragraph 6.)

6. The butt-straps of flat plate keels are to be treble riveted, and as much thicker than the plates they connect as is required for bilge strakes.

7. The stem at its lower part is to be the same moulding as the keel, and attached to it by a scarph of the same length as the keel scarph ; it may be gradually reduced from the height of the load-line to its head, where it may be three-fourths of the sectional area given in Table S 2.

8. The stern and propeller posts, and after end of keel, for single screw propelled vessels, to be of the size given in Table S 2, for stern frames, or of equal sectional area ; the portion adjoining the keel to be tapered fair into it. In a sailing vessel, or paddle steamer, the sternpost may be reduced from the lower part of the rudder trunk to its head, where it may be three-fourths of the sectional area given in the Table ; and in a steam vessel having a propeller frame, it may be reduced at the head to the size given for stems in Table S 2.

9. The portion of the forging of the stern frame forming part of the keel is to extend sufficiently forward for the after end of its scarph in sailing vessels and paddle steamers to be at least once and a half the frame space before the sternpost, and in screw-propelled vessels at least twice and a half the frame space before the propeller post.

10. The stern-post is to be extended sufficiently above the counter to be connected by two vertical angles of the frame size, to the whole depth of the transom-plate, which is to be fitted close against the stern-post. The transom-plate is to be not less than one and a half times the depth of, and the same thickness as, the midship floor-plates. In screw steamers whose plating number is 20,000 and above, the foremost or propeller post should extend sufficiently above the arch of the propeller-frame to be efficiently connected to plating on the beams, and to a deep transom-plate. In single screw steamers above 350 ft. in length the after lengths of shell plating are to be connected to the portion of the stern frame below the boss with three rows of rivets. (*See* Section 7, paragraph 7.)

11. Rudder braces are to be forged on the stern-post, and spaced from 4 feet to 5 feet 6 inches, are not to be less in depth than seven-tenths the diameter of the rudder head, and the thickness one-half the diameter of the pintles.

12. When cast steel stern-frames, rudders, steering quadrants, and tillers are fitted they must be subjected to percussive, hammering, and mechanical tests, in the presence of one of the Society's Surveyors so as to insure the material being of ductile quality. Sketches of the proposed castings are to be submitted for the approval of the Committee. Where stern-frames are in more than one piece, the length of the scarphs should not be less than three times the width of the stern-posts, and the breadth one and a half times the width of the stern-posts, secured by not less than four rows of rivets.

13. The tests to be as follows :—A tensile test is to be made on a piece taken from each casting, and the extension on a length of 8 inches is not to be less than 8 per cent., and the tensile strength not less than 28 tons, nor more than about 35 tons per square inch. A cold bending test also to be made corresponding to each tensile test, and the sample to be one inch square and to bend cold before fracture through an angle of at least 90°.

14. Stern frames cast in one piece to be let fall on hard ground (excavations being made to take bosses and other projections), after being raised through an angle of 45 degrees. Stern frames cast in more than one piece, rudders, steering quadrants and tillers, to be dropped on hard ground from a height of from 7 to 10 feet, according to the design, shape, and weight of the casting. The casting in each case to be subsequently slung up and well hammered with a sledge hammer, not less in weight than 7 lbs., to satisfy the Surveyors that the casting is sound and without flaw. Castings of complex design, which would be liable to be deformed if submitted to the drop test, may have this test dispensed with provided tensile and cold bend tests be made upon two pieces taken from positions as far apart as practicable on each casting. The castings in such cases to be slung up and well hammered as described above.

FRAMES.

Section 6. 1. The frames to be of the dimensions set forth in Table S 1, and to extend from the keel to the gunwale. They are to fit closely to the upper edge of the keel ; and the after frames should be sufficiently apart transversely to admit of sound riveting and workmanship. At the extreme ends of the vessel the lower parts of the frames opposite to each other are to be lapped and riveted together. Where either raised quarter-decks, bridge-houses, poops, or forecastles, are constructed, the frames are to

extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale; they may then terminate at the lower part of the curve. In steamers having a tonnage co-efficient of ·78 or having a full form at the fore part, between the collision bulkhead and the three-fifths length forward, the frames to be doubled from margin plate to margin plate of double bottoms, or to the turn of bilges where double bottoms are not fitted.

2. When the frames are butted on the keel they are to have not less than 3 feet lengths of corresponding angle bars, fitted back to back, to cover and support the butts and receive the plating for at least three-fourths the vessel's length amidships. Similar pieces of angle bar are to be fitted if the frames are butted elsewhere.

3. The rivet holes to be punched through from the faying surfaces of the frames, and they are not to be punched at the turn of the bilge until the frames are bent to the required shape; the holes in the way of the lands of the plating are to be drilled or "beared" after the frames are faired in place, and the plate edges lined off.

4. The spacing of the frames from centre to centre to range from 20 to 27 inches, according to the size of the vessel, which spacing should not be exceeded around the stern of the vessel at the knuckle. (*See* Table S 1.)

FLOOR-PLATES.

Section 7. 1. The floor-plates to be in size at the middle line according to Table S 1, excepting in the engine space in steam vessels, where they must be $\frac{1}{20}$ of an inch thicker, and in the boiler space $\frac{2}{20}$ of an inch thicker. Where floor plates are $\frac{9}{20}$ of an inch in thickness and above they may be reduced $\frac{1}{20}$ of an inch for one-tenth the vessel's length before and abaft the three-fifths length amidships, and the remaining floors may be $\frac{2}{20}$ of an inch less in thickness than the midship floors. They are to be moulded not less than one-half their midship depth* at a distance of three-quarters the half breadth of the vessel set out from the middle line on the run of the frame, and not less at their extreme ends than the moulding of the frames; and they are to extend in a fair curve well up the bilges, in no case terminating lower at the outside of the frame than a perpendicular height of twice the midship depth of the floor above the top of keel. The ends of the floors to maintain the height prescribed for one quarter of the vessel's length amidships, they may then be gradually lowered forward and aft until the upper edges of the floor-plates are level (this place to be determined by the form of the vessel), from which to the ends they are to be gradually increased in depth, so as to efficiently connect the sides; and in the after peak of steam vessels they are to extend above the stern tube. The upper parts of the floors forward and aft are to be high enough to give ample room between the reversed frames on each side of the vessel for fitting the keelson angle bars. (*See also* Section 26, paragraph 2.)

2. A floor-plate to be fitted and riveted to every frame, and to be extended across the middle line, except where a vertical centre-plate is adopted, in which case the floor-plates are to be efficiently connected to it on each side by double vertical angles of not less size than the reversed frames.

3. When floors are made in two lengths, the butts are to be well fitted, and to have double butt-straps treble riveted; or, the floor-plates may be lapped and treble riveted.

4. Floor-plates to which the bulkheads are attached must be deeper than the adjacent floor-plates, to admit of the bulkheads being riveted to them above the reversed angle bars.

* In vessels of unusually fine or full form the moulding should be modified to the approval of the Committee.

5. *In the cases of vessels intended to load or discharge while lying aground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which they may be subjected.*

6. WATERCOURSES are to be formed above the frames through all the floor-plates on each side of the middle line, also at the lower turn of the bilges in vessels of full form, as well as through the vertical centre-plate, and intercostal keelsons, when such keelsons are adopted, so as to allow water to reach the pumps freely.

7. TRANSOM-PLATES are to be fitted and connected to the frames, and to the stern-post, so as to efficiently support the counter. (*See* Section 5, paragraph 10.)

REVERSED ANGLES ON FRAMES.

Section 8. 1. Reversed angles on frames to be in size as per Table S 1.

2. Vessels where the number for regulating the size of the frame is below 45, to have reversed angles riveted to every frame and floor-plate, extending across the middle line to the upper part of the bilges.

3. Vessels where the number as per Rule is 45 and below 57, to have reversed angles riveted to every frame and floor-plate, extending across the middle line to the upper part of the double angle stringer above bilges, and to the gunwale alternately; or, if the vessel is of a depth to require hold beams, the reversed angles are to extend to the upper part of the hold beam stringer angle and gunwale alternately.

4. All vessels, except those having an awning-deck, where the number as per Rule is 57 and upwards, to have reversed angles on every frame, extending alternately to the upper deck stringer plate, and top of angle bar on stringer plate next below it. In awning-decked vessels they are all to extend to the main deck stringer plate. (*See* also Section 26, paragraph 3, Section 45, paragraph 2, and footnote on Table S 6.)

5. In sailing vessels where the number as per Rule is 75 and upwards, the reversed frames are to extend to the gunwale on every frame.

6. Double reversed angles to be fitted on every floor, extending from bilge to bilge in the engine and boiler spaces of steam vessels; and where the vessel is of 17 feet in depth or above from the hold beams, or where the number for plating is 15,000 or above, they are to extend sufficiently high to admit of the stringer at upper part of bilge being connected to them. Short double reversed angles are also to be fitted on all frames in way of the keelsons and stringers in hold, connected by not less than three rivets to the frame.

7. The butts of reversed angles, excepting those at middle line, to be secured with butt straps, having two rivets on each side of the butt.

8. The rivets for securing the reversed angles to the frames and floor-plates to be in diameter in proportion to the greatest thickness of angle, or plate, through which they pass, as specified in Table S 1, and to be spaced seven times their diameter, from centre to centre.

9. In vessels where the plating number is 20,000 and above, reversed angles should be fitted to every frame to the height of the upper, spar, or awning deck, abaft the after peak bulkhead; and in addition, where such vessels have broad flat counters, a double angle stringer should be fitted midway between the middle, and upper, spar, or awning deck beams for a reasonable length, connected by plate knees to the transom plate; or other additional strengthening applied, as the Surveyors may deem necessary.

10. In top-gallant forecastles of vessels whose plating number is 18,000 and above, the alternate reversed frames are to extend to the forecastle deck, or other efficient means of strengthening the forecastle may be adopted, if approved by the Committee.

MIDDLE LINE KEELSONS.

MIDDLE LINE SINGLE PLATE KEELSON.

Section 9. 1. The middle line keelson, if of single plate and standing above the floor-plates, to be of the size prescribed in Table S 3, and to have angles of the dimensions given in the same Tabl fitted and riveted on its upper and lower edges. In addition there is to be a rider plate on the top of the keelson-plate, extending over three-fourths of the length of the vessel amidships, riveted to the angle bars, the breadth of which is to be equal to the sum of the two broad flanges of the keelson angles together with the thickness of the centre plate it covers; the thickness of the rider-plate not to be less than prescribed in Table S 3. The butts of the plates and angles forming this keelson to be properly shifted, and to be efficiently butt-strapped.

2. The butts of the vertical plate to be secured with double butt-straps, each not less than $\frac{3}{20}$ of an inch thicker than half the thickness of the plates they connect, and to be treble riveted, or the plates may be lapped and treble riveted; the butt-straps of the rider-plate to be fitted on the upper side, and to be treble riveted; the butt-straps of the angle bars to be of sufficient length to have not less than three rivets in each flange properly arranged on each side of the butt.

3. Vessels in which the number for plating is 33,000 and above are to have a foundation-plate not less than 18 inches broad and $\frac{10}{20}$ of an inch thick fitted on the top of the floors, under the middle line plate keelson.

MIDDLE LINE INTERCOSTAL KEELSON.

4. If a middle line intercostal keelson be adopted, the plates are to be of the thickness prescribed in Table S 3, and riveted to vertical angles of not less size than the reversed frames, to be fitted and attached to all floor-plates; the intercostal plates to extend from the keel to the top of the floors, and to be fitted close to them. A bulb-plate, at least two inches deeper than required for the main deck beams, is to be let down below the top of the floors, between the reversed angles, sufficiently for the intercostal plates to be riveted thereto, and the bulb to be fitted between, and riveted to, two longitudinal angle bars on the floors, extending all fore and aft, of the size given for keelson angles in Table S 3; or the letting down of the bulb plate may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angles.

5. When intercostal keelsons are adopted with hanging keels, in vessels where the number for plating is 13,000, and under 18,000, instead of a bulb plate there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, having double continuous angles at top and bottom, and a rider plate on its upper edge, of the sizes given in Table S 3; the vertical plate and the rider plate are to be of the thickness required for stringer plates in upper line of Table S 5, and the depth above the floors to be sufficient to admit of the angles being properly fitted. When the number is 18,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table S 3 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table.

6. Where **Flat plate keels** are adopted, intercostal keelson plates attached to the floor plates, or centre through-plates, must be fitted close down on the keel, and connected to it by double angles of the dimensions given for keelson angles in Table S 3, riveted all fore and aft to the keel and keelson, the spacing of the rivets not to exceed 5 diameters apart. For flat keel angles in double bottoms see Table S 7. In vessels where the number for plating is 13,000 and under 15,000, or where the length exceeds ten times the depth, instead of a bulb plate, there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, or connected to the centre through-plate, having double continuous angles, at top and bottom, and a rider plate on its upper edge; the vertical plate and the rider plate are to be not less in thickness than that given in the upper line of Table S 5 for stringer plates, and the depth above the floors to be sufficient to admit of the angles being properly fitted. Where the number is 15,000 and above, the vertical plate and the rider plate are to be of the thickness given in Table S 3 for main keelsons, and the depth of the vertical plate above the floors to be not less than three-fourths of that given in the said Table. Where the number is 26,000 and above, the flat-plate keel to be doubled for one half the vessel's length amidships.

CENTRE THROUGH-PLATE KEEL AND KEELSON.

7. If the middle line keelson be formed of a centre through-plate, extending from the lower edge of the keel to the top of the floors, it must be $\frac{2}{20}$ of an inch thicker than that required in Table S 3 for intercostal keelsons. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to the double vertical angles riveted to their ends and to the centre plate keelson, there is to be a flat keelson-plate, of the same thickness as, and not less than three-fourths the breadth of, the garboard strakes in Table S 2, riveted to double reversed angles on the upper edge of floors, and to two fore and aft angle bars on the upper edge of the centre through-plate keelson; and where the number for plating is 15,000 and under 18,000, there is to be a bulb plate of the size of the main deck beams, fitted between, and riveted to, two longitudinal angle bars of the size for keelson angles in Table S 3, connected to flat plate keelsons and double reverse bars on top of floors. But, should the centre through-plate keelson be extended above the upper edge of the floors, then it is to be connected by two fore and aft angles of the size given in Table S 3, to two flat plates, one on each side of the middle-line to be $\frac{2}{20}$ of an inch thicker than that given for intercostal plates, and one-third the breadth of the garboard strakes, to be well riveted to the double reversed angles on the upper edge of the floors. Where the number is 18,000 and above, the centre through-plate keelson is to extend sufficiently high above the floor-plates to take two pairs of double angles of the size given for keelson angles, and there is to be a rider plate fitted on the top, of the thickness of the keelson plate.

8. In all cases the middle line keelson is to be extended as far forward and aft as practicable.

BILGE KEELSONS, AND STRINGERS IN HOLD.

Section 10. 1. All vessels to have bilge keelsons, extending all fore and aft, and placed at the lower turn of the bilges, formed of double angles fitted back to back, of the size given in Table S 3.

2. If the vessel has but a single tier of beams and her number in Table S 3 is under 7,200, a side stringer, formed of the same size angles, is to be fitted about midway between the bilges and upper deck extending all fore and aft.

3. Where the number is 7,200 and above, and the vessel is under $15\frac{1}{2}$ feet depth to top of keel, two double angle stringers are to be fitted on each side between the bilge keelsons and the deck beams, extending all fore and aft, to be riveted back to back and to double reversed angles on the frames ; the size of them not to be less than those used for the middle line keelson.

4. For stringers in hold, see also Section 14.

5. *In the cases of vessels intended to load or discharge while lying aground, it is recommended that the bottoms be additionally strengthened, in order to withstand the exceptional strains to which they may be subjected.*

SIDE KEELSONS.

Section 11. 1. In vessels where the number in Table S 3 is 13,000 and under 15,000, a double angle keelson is to be fitted on each side, as far forward and aft as practicable, and to be placed about midway between the middle line and bilge keelsons.

2. Where the number is 15,000, and upwards, intercostal plates are to be fitted on each side, as far forward and aft between the floors as practicable, and to be placed about midway between the middle line and bilge keelsons ; these plates are to be fitted close to the floors, and to be attached to the outside plating with an angle of not less size than $3 \times 3 \times \frac{7}{20}$; if the plating number is 21,700 and under 30,400, these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$; and if of 30,400 and above, they are not to be less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$, the intercostal plates are to extend to the top of the floors, and longitudinal plates, in long lengths of the same thickness as the intercostal plates, are to be let down and riveted to them. These plates are to be fitted between, and riveted to, two longitudinal angles of the size given for keelson angles; or the longitudinal plates may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angles and riveted to them.

3. Side intercostal plates or side keelsons need not be fitted in the range of double bottoms ; but where partial double bottoms are fitted, these keelsons are to extend into, or scarph the double bottom not less than three spaces of frames, and to be connected to the longitudinal girders where practicable.

4. Vessels not being of a size to require side intercostal keelson plates are to have washplates of the thickness given for bulkheads in Table S 1, fitted between the middle line and bilge keelsons for not less than half the vessel's length amidships.

5. Where there is no double bottom in the fore part of a steamer of full form, intercostal side keelsons to be fitted between the three-fifths length and the collision bulkead.

DETAILS RELATING TO KEELSONS AND STRINGERS.

Section 12. 1. Where bulb plate is used for keelsons or stringers, the joints are to be overlapped and riveted, or otherwise efficiently connected ; if overlapped, the length of lap must not be less than twice the depth of the bulb plate ; steel of other form than bulb may be used for them if of equal strength.

2. All angle bars for keelsons and stringers are to be in long lengths, properly shifted ; and, wherever butted, to be connected with angle or plate, not less than two feet long, fitted in the throat of them, properly riveted to each flange. The thickness of the connecting plates not to be less than the thickness of the angle bars they connect.

3. In all cases the middle line, side, and bilge keelsons, and, where practicable, the stringers, are to be carried fore and aft continuously through the bulkheads, the latter being made watertight around them ;

and, where such parts of the ship are necessarily separated, the longitudinal strength is to be efficiently maintained, to the satisfaction of the Surveyors.

4. The spacing of the stringers at the ends of vessels, having either single or double bottoms should not exceed the spacing amidships.

5. All keelson and stringer angles may be reduced $\frac{1}{20}$ of an inch in thickness, when above $\frac{7}{20}$ of an inch amidships, for one-fifth the vessel's length at each end.

6. Where keelsons, or other longitudinal strengthening, are required for a certain portion of the length of a vessel care should be taken to lap or properly shift the same, so as to avoid any abrupt termination of strength.

ADDITIONAL STRENGTHENING OF THE FORE PART OF THE FLAT OF BOTTOM OF STEAMERS OF FULL FORM.

Section 12a. 1. Before the three-fifths length of a steamer having a tonnage co-efficient of ·78 or having a full form at the fore part, the rivets in the landing edges of the strakes of plating forming the flat of the bottom to be spaced not more than 4 diameters apart. The rivets in the plating and frames in way of the same to be spaced not more than $5\frac{1}{2}$ diameters apart.

2. The side girders in a double bottom to be extended as far forward and aft as accessibility to all parts will admit. The girder nearest the middle line keelson to be extended to the collision bulkhead, except where fineness of the form of a vessel renders this unnecessary for the efficient stiffening of the bottom plating. Additional intercostal keelsons to be fitted in double bottoms before the three-fifths lengths of the vessel, of one-half the depth of the centre keelson.

3. The frames to be doubled from margin plate to margin plate of double bottoms, or to the turn of bilges where double bottoms are not fitted.

4. The two strakes of outside plating next the garboards to have the midship thicknesses maintained forward to the collision bulkhead.

5. Floors to be fitted in cellular double bottoms to each frame between the collision bulkhead and the three-fifths length of the vessel amidships.

6. Where there is no double bottom in the fore part of a steamer of full form, intercostal side keelsons to be fitted between the three-fifths length and the collision bulkhead.

BEAMS

Section 13. 1. The round up of the beams of all weather decks should not be less than one quarter of an inch per foot of length of beam. This round up of beam will be assumed in taking the measurement for regulating the scantlings, and arrangement of beams and stringers in hold.

2. The beams of the various decks, or of tiers of beams, are to be placed over each other and, as far as practicable, to be fitted to the frames which have reversed frames extended to the upper or spar deck. In single deck vessels with deep framing the deck beams are to be fitted to every frame.

3. Beams are to be of the form and size given in Tables S 4 and S 4A (*see* also Sketches pages 169 and 170), or they may be of other approved form of equal strength. The number of rows of pillars is to correspond with the requirements of Table S 4. Where the length of the midship beams exceed 43ft. not less than two rows of pillars are to be fitted, and where the length

exceeds 55ft. three rows are to be fitted. Where beams are at every frame, pillars are to be fitted at alternate beams and attached to continuous fore and aft girders under the beams. These girders are to be formed of double angles of the reversed frame size or other equivalent section, and they are to be attached to each beam and to all deep beams and bulkheads against which they abut, by short angles. For wide spaced pillars and girders at heads of same, *see* Tables S 1C and S 1D and Sketches.

4. Where *one row of pillars* is fitted, the *beams at the ends* of the vessel which are less in length than two-thirds that of the beam amidships, may be of the sizes required by the columns numbered 2 in Table S 4; and beams at ends less than half the length of the beam amidships may be of the sizes required by columns 3 in Table S 4. Where *two rows of pillars* are fitted amidships, the athwartship distance between the rows is to be about one-third the breadth of the vessel amidships; and the *beams at the ends* which are less than two-thirds the length of the beam amidships, may be supported by one row of pillars, and be of the sizes required by columns 2, and where the lengths of the *beams at the ends* are less than half the midship beam length the sizes may be as required by columns 3 if supported by one row of pillars. Where *three rows of pillars* are fitted amidships, the athwartship distances between the rows of pillars is to be about one-fourth the breadth of the vessel amidships, and the beams throughout are to be of the sizes required for beams amidships by columns 3; but where the lengths of the beams are less than three-fourths the length of the beam amidships, two rows of pillars may be fitted; and where the *beams at the ends* are less than half the midship beam length, one row of pillars may be fitted.

5. Where channel beams, bulb angle beams, or single angle beams are fitted to alternate frames the spacing of the rivets through the beams and the deck plating and stringers should not exceed five diameters centre to centre.

6. If beams of bulb angle section are fitted at alternate frames in vessels exceeding 34 feet in breadth, a steel or iron deck should be fitted on these beams.

7. The beams at the ends of main or middle, upper and spar-deck hatchways, of from six to twelve frame spaces in length, are to be equal in size to those required at alternate frames for the main or middle deck; and the beams at the ends of hatchways of similar lengths in awning decks and bridge decks are to be of the size required for upper deck beams at alternate frames. Single angles fitted to hatchway end beams are to be equivalent in sectional area to the double angles required by Table S 4A. Half beams in way of hatchways or engine and boiler openings may be of the sizes required for beams with two rows of pillars, provided the half beams be efficiently pillared and attached to the coamings.

8. Upper deck beams in way of spaces in bridge-houses intended for carrying coal or cargo, are to be of the sizes required for main deck beams.

9. The beams of decks fitted exclusively for the accommodation of passengers, may be of the size given for upper deck beams of the same length.

10. In sailing ships the lower and orlop deck beams are to be one inch deeper than those required for the upper deck beams of the same length.

11. Beams under a watertight flat must in all cases be fitted to every frame.

12. Strong beams in the machinery space of steamers are to have double angles on their upper and lower edges, unless cross tie plating is fitted on them, in which case only single angles need be fitted to the upper and lower edges of the beams.

13. Where plate knees are not fitted, beam knees are to be efficiently welded, and in sailing vessels they are to be "turned."

14. The thickness of bracket plate knees to be the same as the bulb plate or single angle beams given in Table S 4 if fitted to alternate frames, or the equivalent beams of bulb angle or plain angle section given in Table S 4A if fitted to every frame. The depths of welded knees and the depths and breadths of bracket plate knees are to be regulated by the depths of the bulb plate or single angle beams given in Table S 4 if fitted to alternate frames, or the equivalent beams of bulb angle or plain angle section given in Table S 4A if fitted to every frame.

15. The depths of welded knees and the depths and breadths of bracket plate knees are to be not less than *three* times the depths required for the beams whether at every frame or at alternate frames, in the following cases, viz.:—

(*a*) The upper deck beam knees of steamers having one tier of beams only.

(*b*) The middle deck beam knees of steamers having deep frames or web frames in lieu of a tier of beams.

(*c*) Where beams are supported by three rows of pillars and are of the sizes required by the Tables.

(*d*) The upper deck beam knees in way of omitted middle deck half beams.

(*e*) The beam knees at watertight flats for deep tanks, including peak tanks.

(*f*) The upper, lower, and orlop deck beam knees of sailing vessels.

16. Where two rows of pillars are fitted and the beams are of the corresponding sizes required by the Tables, the beam knees are to be two and three quarter times the depth of the beams. The depths of all other beam knees are not to be less than two and a half times the depths required for the beams whether fitted to alternate frames or to every frame.

17. Beam knees are to measure across the throats not less than six-tenths of the depths required for the knees.

18. Not more than two holes are to be punched in each beam knee before the beam is properly adjusted in its position.

19. The number and size of the rivets in the beam knees, or in both arms of bracket plate knees, are to be sufficient to ensure the riveted parts being efficiently closed and in no case to be less than given in the following table:—

Depth of Knee.	Number of rivets.	Diameter of rivets.
Under 17 inches.	4	$\frac{3}{4}$ of an inch.
17 and under 21 ,,	5	$\frac{3}{4}$,,
21 ,, ,, 24 ,,	5	$\frac{7}{8}$,,
24 ,, ,, 28 ,,	6	$\frac{7}{8}$,,
28 ,, ,, 32 ,,	7	$\frac{7}{8}$,,
32 ,, ,, 36 ,,	8	$\frac{7}{8}$,,
36 ,, ,, 40 ,,	9	$\frac{7}{8}$,,

SPACING OF BEAMS AND STRINGERS IN HOLD.

Section 14. 1. The spacing of beams is to be regulated by the depth amidships, measured from the top of keel to the top of the upper, spar, or awning-deck beams as described in Section 1, paragraph 8, excepting in awning-decked vessels of less than $17\frac{1}{2}$ feet depth to the main deck, in which case the arrangement of stringers in hold, &c., is to be regulated by the depth to the main deck. (*See* also Section 10, paragraphs 2 and 3.)

2. All upper deck beams and the middle deck beams of three-decked ships, and the main deck beams of spar and awning-decked ships, to be fastened to alternate frames, except where steel decks are fitted as provided for in Table S 4.

3. All Vessels under 13 feet in depth are to have a double angle stringer extending all fore and aft about midway between bilge keelson and deck beams, riveted back to back and to double reversed angles on the frames.

4. All Vessels of 13 and under 14 feet in depth to have, in addition to the foregoing, bulb plate of the size required for the deck beams, riveted between the continuous double angle stringer for three-fifths the vessel's length amidships; or the bulb may be dispensed with, provided that, in lieu thereof, intercostal plates in long lengths be fitted between the double angle stringer, and attached by single angle bars to the outside plating.

5. All Vessels of 14 and under $15\frac{1}{2}$ feet in depth to have, instead of the bulb plate, as described above, a plate not less than 12 inches wide and $\frac{7}{20}$ of an inch thick, connected to the outside plating, with double angles fitted on the inner edge of the size of the keelson angles, extending all fore and aft.

6. All Vessels of $15\frac{1}{2}$ feet depth and above to have a double angle stringer of the size given in Table S 3, extending all fore and aft at the upper turn of the bilge on each side.

7. All Vessels of $15\frac{1}{2}$ and under $16\frac{1}{2}$ feet in depth to have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with a stringer plate of the size given in Table S 5 for hold beam stringers, attached to the plating and supported by brackets at every alternate frame between the beams, and secured to the beams by efficient gusset plates.

8. All Vessels of $16\frac{1}{2}$ and under $17\frac{1}{2}$ feet in depth to have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Table S 5, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate. On the inner edge of the stringer plate, between the beams, an angle bar is to be fitted, of the size given for keelson angles in Table S 3, with its deep flange vertical, and covering the ends of the bracket plates.

9. All Vessels of $17\frac{1}{2}$ and under $18\frac{1}{2}$ feet in depth to have lower deck beams fastened to every second and fourth frame alternately, or they may have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case.

10. All Vessels of $18\frac{1}{2}$ and under $19\frac{1}{2}$ feet in depth to have lower deck beams fastened to every second and fourth frame alternately; or they may have hold beams as described in the foregoing paragraph, fastened to every tenth frame, provided double angle bars $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$, be fitted on the inner edge of the stringer plates with a face plate $\frac{7}{20}$ of an inch in thickness, and gusset plates at the beam ends.

SAILING VESSELS.

11. **Sailing Vessels** of $19\frac{1}{2}$ and under 23 feet in depth to have lower deck beams fitted to every alternate frame.

12. SAILING VESSELS of 23 and under 24 feet in depth from the upper part of the upper deck beams, or of 16 and under 17 feet from the upper part of the lower deck beams to the top of the keel, to have the lower deck beams fitted to every alternate frame, and to have two double angle stringers extending fore and aft, between the bilge keelson and lower deck beams, on each side.

13. SAILING VESSELS of 24 and under 26 feet in depth from the upper part of the upper deck beams, or 17 and under 18 feet from top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have in addition to the above, bulb plates of the size of the lower deck beams with one row of pillars fitted and riveted between each of the two side stringers in lower hold on both sides, to extend all fore and aft.

14. SAILING VESSELS of 26 and under 27 feet in depth, from the upper part of the upper deck beams, or 18 and under 19 feet in depth, from top of lower deck beams, to have, in addition to the foregoing, intercostal plates of the thickness given in Table S 3, attached to the outside plating, and fitted to the upper stringer, all fore and aft, and to the lower stringer from one-fourth of the vessel's length aft, until it is incorporated with the panting stringer.

15. SAILING VESSELS of 27 and under $28\frac{1}{2}$ feet in depth from upper deck, or of 19 and under $20\frac{1}{2}$ feet in depth from top of lower deck beams, are to have the lower deck beams fitted to every alternate frame, and to have orlop stringer plates of the dimensions required for hold beam stringer plates in Table S 5 fitted and attached to the outside plating and reversed frames by angle bars of the size given in Table S 3; these stringers to be supported by bracket-plates riveted to them, and to alternate frames; and upon the inner edge of the stringer-plate an angle bar of the size of keelson angles, as per Table S 3, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates. Or, if preferred, an additional side stringer to those required in the preceding paragraph may be fitted, formed of double angles, bulb, and intercostal plates attached to the outside plating and fitted all fore and aft.

16. SAILING VESSELS of $28\frac{1}{2}$ and under $29\frac{1}{2}$ feet in depth from the upper deck, or of $20\frac{1}{2}$ and under $21\frac{1}{2}$ feet from the top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have orlop beams of the size given in Table S 4 for "hold beams of extra strength" fitted to every tenth frame, with an angle bar on the inner edge of the stringer plate, as in the preceding paragraph; or these beams may be twelve frame spaces apart, provided double angles $4 \times 3\frac{1}{2} \times \frac{7}{20}$, be fitted on the inner edge of the stringer plate with their deep flange vertical, and with a face plate $\frac{8}{20}$ of an inch in thickness. These beams are to be secured to the stringer plate by efficient gusset plates.

17. SAILING VESSELS, when the Plating Number is 24,000 and under 27,000, are to have a bulb plate of the size required by Table S 4 for the lower deck beams with one row of pillars fitted to the side keelson for two-thirds the length of the vessel amidships, and intercostal plates are to be fitted to the bilge keelson for half the vessel's length amidships. When the Plating Number is 27,000 and under 30,000, a vertical plate is to be fitted to the side keelson for two-thirds the vessel's length amidships, the plate to be one-half the depth, and the same thickness as that required for the middle line keelson, with double angles and a rider plate on the upper edge. The double angles to be of the size required for upper deck stringer angles, and

the rider plate to be of the same thickness as the vertical plate. In addition to this, intercostal plates are to be fitted to the bilge keelson for half-length amidships, with a bulb plate of the size required for lower deck beams for three-fifths the length of the vessel amidships. When the Plating Number is 30,000 and under 33,000, a vertical plate is to be fitted to the side keelson for two-thirds the vessel's length amidships, the plate to be three-fourths the depth of and the same thickness as that required for the middle line keelson, with double angles and a rider plate fitted on the upper edge. The double angles to be of the size required for upper deck stringer angles, and the rider plate to be of the same thickness as the vertical plate. In addition to this, intercostal plates are to be fitted to the bilge keelson for two-thirds the length amidships, with a bulb plate of the size required for lower deck beams with one row of pillars for three-fifths the length.

STEAM VESSELS.

18. **Steam Vessels** of $19\frac{1}{2}$ and under 22 feet in depth to have lower deck beams fastened to every alternate frame; or hold beams of extra strength, as given in Table S 4, may be fitted to every eighth frame, provided an angle bar, of the size given for keelson angles in Table S 3, be fitted on the inner edge of the stringer plate, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angle bars $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$, and a face plate, $\frac{8}{20}$ of an inch in thickness, be fitted on the inner edge of the stringer plate, with gusset plates as above.

19. STEAM VESSELS of 22 and under 23 feet in depth to have, in addition to the foregoing, an extra side stringer, formed of double angles of the size of the keelson angles, fitted between the hold beams and bilge stringer, extending as far forward and aft as practicable.

20. STEAM VESSELS of 23 and under 24 feet in depth to have, in addition to the above, a bulb plate of the size required for lower deck beams, with one row of pillars fitted between the double angles of each of the side stringers, all fore and aft.

21. STEAM VESSELS of 24 and under 26 feet in depth from the upper part of the upper deck beams, or of 17 and under 18 feet from the upper part of the lower deck beams to the top of the keel, to have the lower deck beams fitted to every alternate frame, and to have hold beams of extra strength, as given in Table S 4, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Table S 5 for hold beam stringer plates; and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; and on the inner edge of the stringer plate, between the beams, an angle bar is to be fitted, of the size given for keelson angles in Table S 3, with its deep flange vertical, and covering the ends of the bracket plates.

22. STEAM VESSELS of 26 and under 27 feet in depth from the upper deck, or 18 and under 19 feet from top of the middle deck beams, to have lower deck beams fastened to every second and fourth frame alternately. Or they may have hold beams of extra strength, as given in Table S 4, fastened to every eighth frame, and to have an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case; or they may be spaced wider, not exceeding ten frame spaces, provided double angles $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$ be fitted on the inner edge of the stringer plate, with a face plate on them $\frac{8}{20}$ of an inch in thickness.

23. Steam Vessels of 27 and under 28 feet in depth from the upper deck, or 19 and under 20 feet from the top of the middle deck beams, to have lower deck beams fastened to every second and fourth frame alternately. Or they may have hold beams of extra strength as given in Table S 4, fastened to every eighth frame, and to have an angle bar on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case; or these beams may be ten frame spaces apart, provided double angles $4 \times 3\frac{1}{2} \times \frac{7}{20}$ be fitted on the inner edge of stringer plate with their deep flange vertical and with a face plate $\frac{8}{20}$ of an inch in thickness.

24. Steam Vessels of 28 and under 30 feet in depth from the upper deck, or 20 feet and under 22 feet from the top of the middle deck beams, to have lower deck beams fastened to every alternate frame. Or if hold beams of extra strength, as given in Table S 4, be fitted, they may be fastened to every eighth frame, provided an angle bar of the size given for keelson angles in Table S 3, be fitted on the inner edge of the stringer plate and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angles, $4 \times 4 \times \frac{8}{20}$, and a face plate $\frac{9}{20}$ of an inch in thickness be fitted on the inner edge of the stringer plate, with gusset plates at the beam ends.

25. Steam Vessels of 30 and under $32\frac{1}{2}$ feet in depth from the upper deck, or 22 and under $24\frac{1}{2}$ feet from the top of the middle deck beams, to have lower deck beams fastened to every alternate frame. Or if hold beams of extra strength, as given in Table S 4, be fitted, they may be fastened to every eighth frame, provided an angle bar of the size given for keelson angles in Table S 3, be fitted on the inner edge of the stringer plate, and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding ten frame spaces, provided double angles $4 \times 4 \times \frac{8}{20}$, and a face plate $\frac{9}{20}$ of an inch in thickness, be fitted on the inner edge of the stringer plate, with gusset plates at the beam ends. In either case, in addition, a double angle stringer, of the size given for keelson angles in Table S 3, with bulb plate between, is to be fitted midway between the bilge stringer and the hold beams.

26. Steam Vessels of $32\frac{1}{2}$ and under 36 feet in depth from the top of the upper deck beams to the top of keel, or in which the depth from the top of the lower deck beams is $17\frac{1}{2}$ and under 21 feet, to have the lower deck beams fitted to every alternate frame, and to have below them an orlop stringer plate attached to the outside plating and reverse frames, of the thickness, and three-fourths of the breadth, of the lower deck stringer plates, supported by bracket plates riveted to them and to alternate frames; and upon the inner edge of the stringer plate an angle bar, of the size of keelson angles, as per Table S 3, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates; or a stringer of other form may be fitted, if approved by the Committee.

27. Steam Vessels of 36 and under 39 feet in depth from the top of the upper deck beams to the top of keel, or in which the depth from the top of the lower deck beams is 21 feet or above, are to have the lower deck beams fitted to every alternate frame, and to have orlop beams, of the size given in Table S 4 for "hold beams of extra strength," fitted to every tenth frame, with stringer plates on them, and gusset plates at their ends. The stringer plates to have angle bars on their inner edge, as in preceding paragraph.

28. Gusset plates to be fitted to hold beam stringer plates at all bulkheads where strong hold beams are fitted.

29. Plans of all vessels above 39 feet in depth must be submitted for the consideration of the Committee, with a view to additional strength being provided. And in all vessels where the height between deck stringers at the sides is 8 feet or above, at any part, additional transverse strength at such part must be submitted for approval.

30. When the beams exceed two spaces of frames apart, a knee or bracket plate is to be riveted to alternate frames and to the stringer plate of the thickness required for the frames amidships.

31. Notwithstanding the foregoing arrangements for the spacing of beams, whenever a deck is laid, the beams are not to be further apart than two frame spaces.

32. Where it is necessary, in consequence of long hatchways, engine-rooms, boiler spaces, &c., to dispense with some of the hold or lower deck beams, compensation must be made by fitting hold beams of extra strength, as given in Table S 4, with gusset plates, and angle bars, &c., on the stringer plates, or extra web frames to the satisfaction of the Committee.

33. If an arrangement differing from the foregoing in the spacing of the hold beams, to suit convenience of stowage, be required, a sketch showing beams and stringers of extra strength, web frames or deep framing, with all particulars, must be submitted through the resident Surveyors, who are to state their opinion thereon, for the Committee's consideration.

34. In way of raised quarter decks, where the depth from the top of the keel to the top of the raised quarter deck beam is 24 feet, or above, and the lower deck hatchways are not framed, a web frame is to be fitted abreast of the hatchway, extending from the floors to the upper deck. Where web frames are fitted in lieu of strong hold beams and the lower deck hatchways are not framed, the web frames in way of the hatchways are to be spaced as required by Section 14a, and extended to the upper deck.

WEB FRAMES IN LIEU OF HOLD BEAMS. (See also Sketches, pages 152 to 155.)

Section 14a. 1. Web frames in conjunction with side stringers in hold will be admitted in lieu of wide spaced hold beams and stringers, if arranged in accordance with the conditions specified below :—

The depth of the vessel for regulating the spacing and depth of web frames, and the number of side stringers required to be fitted, is to be taken from the top of the keel to the top of the first complete tier of beams (other than wide spaced beams), assuming the beams to have the normal round up of one quarter of an inch to the foot of length of beams.

2. When web frames and side stringers are fitted in lieu of hold beams, the web frames and stringers to be of the thickness required for the frames.

3. Double angles are to be riveted on the inner edge of the web frames and stringers ; these angles and those connecting the stringers to the web frames and outside plating, also the angles connecting the stringers to the reversed frames, between the web frames, are to be of the same size as the reversed frames. Single face angles of the sizes given in Table S 3A may, if preferred, be substituted for the double angles described above provided double angles be fitted in way of the diamond plates described in next paragraph. The web frames to be attached to the margin plate of double bottom by double angles, or to the inner bottom by efficient gusset plates.

4. An efficient diamond plate of the thickness of the web frames is to be fitted at the junction of the web frames and stringers, and to be not less than 24 inches × 18 inches for web frames 14 inches deep; 30 inches × 21 inches for web frames 15 inches deep; and 30 inches × 24 inches when the depth of the web frames exceeds 15 inches. Half diamond plates may be fitted of the sizes given by Table S 3A.

5. The through beams attached to the head of web frames are to be in all cases of the depth required for "beams of extra strength," excepting where an iron or steel deck is fitted on these beams in which case they may be of the ordinary rule size of beams to alternate frames.

6. When web frames are fitted in way of half beams they are to be connected at the head by large bracket knee plates.

7. The side stringers are to be supported by a bracket knee plate of the thickness required for frames midway between the web frames, when 18 inches in width, except when the web frames are spaced 8 feet apart, when the bracket plates will not be required.

8. On those frames where web frames are not fitted the reversed frames are to extend to the upper deck and the stringer plate next below alternately, except in three-deck and spar-decked vessels where web frames are fitted below the middle deck, in which case the reversed frames are to extend as specified in Section 41, paragraph 5, and Section 42, paragraph 6 respectively.

9. **Vessels of under 16 feet in depth from top of keel,** requiring hold beams, to have web frames 14 inches in depth, eight frame spaces apart, with one side stringer plate above the bilge stringer, fitted intercostally between the web frames, and connected to them by angles and diamond plates as previously described.

10. **Vessels of 16 feet and under 17 feet in depth,** to have web frames 15 inches deep, not more than eight frame spaces apart, with one side stringer plate above the bilge stringer as described in preceding paragraph.

11. **Vessels of 17 feet and under 18 feet in depth,** to have web frames 15 inches deep not more than eight frame spaces apart with two side stringers, in which case the double angle bilge stringer may be omitted (except in vessels other than Awning deck requiring three tiers of beams, and under 18 feet to the middle or lower deck, when the web frames should be not more than six frame spaces apart).

12. **Vessels of 18 feet and under $21\frac{1}{2}$ feet in depth,** to have web frames 15 inches deep, not more than six frame spaces apart with two side stringers. When of this depth to the middle deck, the web frames are to be 18 inches deep, except in the case of Awning deck vessels where the web frames may be 16 inches deep.

13. **Vessels of $21\frac{1}{2}$ feet and under $22\frac{1}{2}$ feet in depth,** to have web frames 15 inches deep, not more than six frame spaces apart with three side stringers, or web frames with two side stringers 18 inches deep may be substituted, in vessels fitted with a double bottom, provided the brackets outside the margin plate be extended up the bilges to a height of three times the depth of the ordinary rule floor at the middle line. When of this depth to the middle deck, the web frames to be 18 inches deep, with three side stringers, except in the case of Awning deck vessels where the web frames may be 16 inches deep.

14. **Vessels of $22\frac{1}{2}$ feet and under $23\frac{1}{2}$ feet in depth,** to have web frames 16 inches deep, not more than six frame spaces apart with three side stringers. When of this depth to the middle deck, the web frames to be 18 inches deep, except in the case of Awning deck vessels where the web frames may be 16 inches deep,

15. **Vessels of $23\frac{1}{2}$ feet and under 24 feet in depth,** to have web frames 18 inches deep, spaced not more than six frame spaces apart, with three side stringers, as in the preceding paragraph.

Web frames in way of RAISED QUARTER-DECKS, in lieu of lower deck beams and beams of extra strength wide spaced in lower hold.

16. **Vessels of 24 feet and under 25 feet** to the quarter-deck, to have web frames 16 inches deep, five frame spaces apart with three side stringers; and not less than four beams of extra strength, formed of plate and four angles as prescribed in Table S 4 are to be fitted and efficiently connected to one of the side stringers, and to the web frames by large gusset plates and vertical bracket plates, of the thickness of the side stringers. In addition, a water-tight transverse bulkhead to be fitted about midway between the after engine-room bulkhead and the after end of the vessel.

17. **Vessels of 25 feet and under 26 feet,** to have web frames 16 inches deep, from four to five frame spaces apart, with three side stringers, and not less than four beams of extra strength, and an additional water-tight bulkhead as in preceding paragraph.

18. **Vessels of 26 feet and under 27 feet,** to have web frames 18 inches deep, four frames spaces apart, with three side stringers and not less than four strong beams, and an additional bulkhead as above,

19. **Vessels of 27 feet and under 28 feet,** to have web frames 18 inches deep, four frame spaces apart, with four side stringers, and not less than four strong beams, and an additional bulkhead as previously described.

20. In all cases where web frames are fitted in lieu of lower deck and hold beams, as set forth in the foregoing paragraphs, the bulkheads are to be additionally stiffened by a centre vertical web and semi-box beam so as to compensate in an efficient manner for the omission of the support which would be afforded by these decks in case such were fitted.

DEEP FRAMING IN LIEU OF HOLD BEAMS.

(See also Sketches, on page 156.)

Section 14b. 1. Where deep framing is adopted in steam vessels, in lieu of a tier of wide spaced hold beams, the depth of the framing should be as required by Table S 1, in vessels having double bottoms, in which the bracket knee plates outside the margin plate are extended up the bilge to a height of not less than two and a half times the depth of the midship ordinary floor. In vessels without double bottoms, the depth of the framing should be increased by one half inch.

2. When the deep framing is composed of frame and reversed frame the thickness of the angles and width of the fore and aft flanges should not be less than is given in the table for ordinary frames.

3. The two angles forming the framing are to be attached by a single riveted lap, $2\frac{1}{2}$ inches in width where the rivets are $\frac{5}{8}$ of an inch in diameter, 3 inches where they are $\frac{3}{4}$ of an inch and $3\frac{1}{2}$ inches where $\frac{7}{8}$ of an inch. The rivets connecting the frames and reversed frames are to be spaced as required for the rivets attaching the outside plating to the frames.

4. The inner angles forming reversed frames are to be extended to the upper deck in two deck vessels, and in other vessels as required by Section 8, provided the height between decks does not exceed 8 feet. Where the reversed frames do not extend to the full height of the frame angles, the depth of the transverse flange of the frames is not to be less than required by Table S 1 for ordinary frames.

5. Where channel or zed frames are fitted in lieu of deep framing formed of frames and reversed frames, the thickness is to be one-twentieth of an inch greater than given in Table S 1, and where bulb angle frames are fitted the thickness is to be two-twentieths of an inch greater. The depth of framing and width of flanges are in all cases to be in accordance with the requirements of Table S 1.

6. The number of side stringers is to be regulated by the depth at the middle line from top of keel to the top of the first complete tier of beams (other than wide spaced beams); where this depth is under $21\frac{1}{2}$ feet, two side stringers are to be fitted; and where the depth is $21\frac{1}{2}$ feet and under 24 feet, three side stringers are to be fitted. The side stringers are to be formed of continuous angles, of the size required by Table S 3A, fitted on the inside of the reversed frames in conjunction with intercostal plates which are to extend to, and be connected to the outside plating. The intercostal plates and angles are to be of the thickness required for the frames. The intercostal angles are to be 3 ins. × 3 ins. where the rivets in the outside plating are $\frac{3}{4}$ in. in diameter, and $3\frac{1}{2}$ ins. × $3\frac{1}{2}$ ins. where they are $\frac{7}{8}$ in. in diameter. The stringer angles are to be attached to each reversed frame by at least two rivets, and connected to the transverse watertight bulkheads by means of bracket plates $\frac{1}{20}$th of an inch thicker than the intercostal plate and of the dimensions shown by the Sketch on page 158.

7. Where this system of framing is adopted, the beam knees of the lower tier are to be three times the depth of the beams. In single deck vessels the deck beams are to be fitted to every frame.

8. In the case of Three deck and Spar deck vessels, these Rules are framed for vessels in which the height between decks is from 7 to 8 feet; where these limits are departed from, the cases will be specially considered by the Committee.

9. When deep framing is adopted in vessels over $32\frac{1}{2}$ feet from top of keel to top of upper deck beams, plans are to be specially submitted for the consideration of the Committee.

10. In vessels with deep framing the web frames required in the Engine and Boiler space by Section 26 may be spaced about ten frame spaces apart.

11. When deep framing is adopted under Raised Quarter decks, the depth of the framing, and the scantlings of the frames, reversed frames and side stringers are to be regulated by the frame number obtained by adding the height of the raised quarter deck to the frame number of the vessel to main deck, and the number of stringers is to be regulated by the depth at middle line from top of keel to top of raised quarter deck. Strong beams and additional watertight bulkheads are to be fitted, as required by Section 14a, when web frames are adopted.

PILLARS.

Section 15. 1. Pillars are to be of malleable steel or iron of the sizes given in Tables S 1A, S 1B, and S 1C, or they may be of other approved form of equal strength. The number of rows of pillars is to correspond with the requirements of Table S 4, and Section 13, paragraph 4. Where the length of the midship beam exceeds 43 feet, not less than two rows of pillars are to be fitted, and where the length exceeds 55 feet three rows are to be fitted. Where beams are at every frame, pillars are to be fitted at alternate beams and attached to continuous fore and aft girders under the beams. These girders are to be formed of double angles of the reversed frame size or other equivalent section,

and they are to be attached to each beam, and to all deep beams and bulkheads against which they abut, by short angles. For wide spaced pillars and girders at heads of same, *see* Tables S 1C and S 1D and sketches.

2. Pillars to beams are to be arranged between decks and in the holds so as to form continuous ties from the floors to the weather deck beams. The heads of pillars are to be fitted close under the beams or girders, and the heels are also to be fitted close. Where the lengths of pillars are 10 feet and under 18 feet, or the diameters are $2\frac{5}{8}$ inches and under 4 inches, the ends are to be attached by not less than two $\frac{7}{8}$ inch rivets. Where the lengths are 18 feet and under 24 feet, or the diameters are 4 inches and over, there are to be not less than two 1 inch rivets in each end of the pillars. Where the lengths exceed 24 feet, there are not to be less than three 1 inch rivets in each end.

3. The heels of pillars at inner bottoms are to be fitted and riveted to short tee or angle bars.

4. Where beams are fitted of the scantlings required with two or three complete rows of pillars, the row of pillars on each side is to be continued in way of all deck openings.

5. Pillars under wide spaced hold beams may be of the sizes required for pillars of the same length under the deck next above the hold beams.

6. If a middle or main deck is intended exclusively for passengers the pillars between this deck and the floors may be $\frac{1}{4}$ inch less in diameter than is required by Tables S 1A and S 1B, and where the lower deck is also intended for passengers exclusively the pillars between this deck and the floors may be $\frac{1}{2}$ inch less in diameter than is required by the Tables.

7. Where beams are fitted to every frame of the sizes required with two rows of pillars, the pillars in way of the hatchways may be spaced four frame spaces apart, provided the diameters of these pillars be increased $\frac{1}{2}$ of an inch and intercostal plates $\frac{9}{20}$ of an inch in thickness be riveted to the girders under the beams and be attached to the deck plating by angles $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$ fitted between the beams, extending from one frame space before to one frame space abaft such hatchways.

8. A row of pillars fitted at the middle line to every alternate frame in conjunction with two rows of pillars fitted to every fourth frame at the quarter breadth of the vessel may be taken as equivalent to two complete rows of pillars, provided beams are fitted to every frame, and intercostal plates $\frac{9}{20}$ of an inch in thickness be riveted to the girders at the heads of the quarter pillars, and be attached to the deck plating by angles $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$ fitted between the beams, but in way of hatchways the quarter pillars are to be increased $\frac{1}{2}$ of an inch in diameter.

9. A complete row of quarter pillars attached to an intercostal girder should be fitted on each side of the middle line bulkhead in deep tanks.

10. The pillars to the coamings of hatchways in vessels where only a centre row of pillars is fitted are not to exceed four frame spaces apart on each side, and hatchways 26 feet in length and above are to be pillared at the corners in addition. Under deck houses, heel of bowsprit, windlass, steam winches and capstans, the beams are to be additionally pillared.

11. Where double pillars are fitted for the purpose of securing shifting boards, they are not to be less than three-fourths the diameter required for single pillars.

12. If pillars be fitted on a shaft tunnel, the tunnel should be strengthened in way of them, by doubling plates, angle bars, and a transverse vertical plate, or by other efficient means.

13. Where a middle line bulkhead is fitted in lieu of pillars, its thickness is not to be less than $\frac{5}{16}$ of an inch, and it is to be connected at the bottom and to plating on the beams by double angles not less than $3 \times 3 \times \frac{7}{16}$, and to be stiffened vertically by double angles of the size required by Table S 1 for the frames, or by tee bars of equivalent section, spaced two frame spaces apart; the stiffeners on one side of the bulkhead should be attached to the beams. The stiffeners in the 'tween decks may be of double angles of the size required for the reversed frames and be spaced two frame spaces apart.

14. The beams in the machinery space are to be pillared where practicable. Quarter pillars at this part may be dispensed with provided the beams are supported by straight bunker sides or casings of not less than $\frac{5}{16}$ of an inch thick, stiffened as required for middle line bulkheads.

STRINGERS ON BEAMS.

Section 16. 1. All vessels to have stringer plates upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one and two deck vessels, the upper and middle deck beams of three deck vessels, and upon the main deck beams of spar and awning-decked vessels, to be of the breadth and thickness given for main stringer plates in Table S 5, for half the vessel's length amidships; from thence to the ends of the vessels they may be gradually reduced to the dimensions given for the ends of main stringer plates in Table S 5.

2. The stringer plates on ends of the beams next below the upper deck in two deck vessels, and below the middle deck in three deck vessels, and below the main deck in spar or awning-decked vessels, to be of the breadth and thickness given for hold beam and lower deck stringers in Table S 5.

3. The stringer plates on the ends of spar-deck beams are to be the breadth of, and may be $\frac{1}{20}$ of an inch less in thickness than, the stringer plates given on the upper line of Table S 5 for vessels of the same plating number, and may be reduced at their ends $\frac{1}{20}$ of an inch in thickness, and to the breadth given for the ends of main deck stringer plates in Table S 5.

4. The stringer plates on the ends of awning-deck beams to be as per Section 43, par. 7, and Table S 2A.

5. The stringer plates on all tiers of beams are to be fitted home and riveted to the outside plating, all fore and aft, with angle bars of the dimensions required by Table S 3; the middle, lower, and orlop deck stringer plates to have an additional angle bar of the same dimensions extending all fore and aft riveted to the reversed frames and to the stringer plates. (For riveting of butts see Section 20.)

6. In cases where no deck is laid, and the width of the stringer plate on the ends of the hold beams is objected to, it may be reduced, provided such reduction be fully compensated for and receive the sanction of the Committee.

7. When the frames are extended through the upper deck stringer plate to form frames for bridge-houses, or poops and forecastles, there must be a continuous angle bar, of the size given for lower deck stringer angles, wrought on the upper deck stringer plate inside the frames.

8. The main and hold beam stringer plates may be reduced at the ends of the vessel to the sizes given for the same in Table S 5.

9. The upper deck stringer angle bar is in all cases to be fitted on the upper side of the stringer plate.

10. When gutter waterways are fitted to upper decks in vessels having poops or forecastles, the angle bars forming the ends of the gutters are to be welded, and the gutters to be carefully caulked.

TIE-PLATES ON BEAMS.

Section 17. 1. All vessels to have tie-plates ranging all fore and aft upon each side of the hatch ways on each tier of beams, these plates to be lapped or butted, and at least double riveted. Upon hold beams, or lower deck beams spaced two to four frame spaces apart, on which no deck is to be laid, or where tie-plates would interfere with stowage of cargo, double angle bars of the dimensions given in Table S 3 for angle bars on lower deck beam stringer plates, placed at middle line or at each side of the hatchways, extending fore and aft wherever practicable, and well riveted to all beams and stringers, will be admitted in lieu thereof.

2. Diagonal tie plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged; and in addition, where the plating number is 15,000 and above diagonal tie-plates are to be fitted all fore and aft on the upper deck.

3. Where diagonal tie-plates cross each other, or the fore and aft tie-plates, between the beams, and a deck is to be laid thereon, one set of tie-plates must be set down in way of the crossing, so as to leave one thickness only projecting above the beams.

4. The tie-plates to be of the width and thickness given in Table S 5, for half the vessel's length amidships, tapered at the ends to the same thickness as the ends of the stringer plates. They are to be well riveted to each other and to the beams and stringers; and all butts to be properly shifted.

HOOKS AND CRUTCHES AND PANTING ARRANGEMENTS.

Section 18. 1. All stringers, where practicable, to extend fore and aft, and to be efficiently connected at their ends with plates forming hooks and crutches of the same thickness as the floor-plates amidships, and those below the hold beams should be spaced about 4 feet apart. In vessels whose plating number is 24,000, or above, an additional hook or crutch should be fitted at the ends of the vessel, between each tier of beams, to the satisfaction of the Surveyors.

2. The depth for regulating the number of tiers of beams to alternate frames in the fore peak to be taken at the collision bulkhead, and the beams fitted in accordance with Section 14 for this depth. All vessels to have, in addition, provision made to prevent panting by extra beams, bracket knees and stringer plates being fitted before and abaft the collision bulkhead. Panting beams and stringers to be fitted at the after end where considered necessary by the Surveyors. Where a vessel has greater sheer than the normal amount defined in the Freeboard Tables, additional transverse strength in the form of beams or otherwise is to be provided in the fore and, or, after holds. In the application of this requirement, the standard sheer given in the Tables is to be apportioned two thirds at stem and one third at stern post.

3. Sailing vessels under 20 feet in depth at the collision bulkhead, to have lower deck or panting beams fitted to alternate frames in the peak, with a stringer plate two-thirds the breadth of the lower deck stringer plate amidships. Vessels 20 feet and under $30\frac{1}{2}$ feet in depth to have in addition to the lower deck beams, a tier of panting beams with a stringer plate two-thirds the breadth of the lower deck stringer plate amidships. Vessels $30\frac{1}{2}$ feet and under 33 feet in depth to have two tiers of panting beams below the lower deck with stringer plates on their ends.

4. The stringer plates on the panting beams to be attached to the outside plating when fitted in continuation of intercostal stringers. These plates are to extend abaft the collision bulkhead for a length of not less than one-fourth the midship breadth of the vessel, and be efficiently supported by

brackets at alternate frames. Panting beams and stringers to be fitted at the after end where considered necessary by the Surveyors.

5. Plans of proposed panting arrangements in vessels of 33 feet in depth and above to be submitted for the consideration of the Committee.

PLATING.*

Section 19. 1. The thickness of the outside plating as given in Table S 2, for half the vessel's length amidships, is to be maintained for that length, but it may thence be gradually reduced to the thickness given for the extreme ends, by gradations of $\frac{1}{20}$ of an inch over equal parts before and abaft the half-length amidships. In a steamer having a tonnage co-efficient of ·78, or having a full form at the fore part, the two strakes of outside plating next the garboards to have the midship thicknesses maintained forward to the collision bulkhead. In all screw steamers the garboard plates connected to the stern frame, and where the plating number is 16,600 or above, also the after lengths of plating so connected, must be of the thickness required for the same strakes amidships. In sailing vessels, the outside or overlapping strakes of plating for one-quarter of the vessel's length at her fore end should only be reduced $\frac{1}{20}$ of an inch from the midship thickness ; and where the plating number is 16,000 or above, three strakes of plating at the bilges are to be increased $\frac{1}{20}$ of an inch in thickness throughout, and when the plating number is 22,000 and above, the strake of plating in way of the hold beams is to be increased $\frac{1}{20}$ of an inch in thickness for one-half the vessel's length amidships.

2. In the columns for plating in Table S 2, where two thicknesses are given they are to be worked in alternate strakes, and the greater thickness is to apply to the outer strakes, and the lesser thickness to the inner strakes ; and the size of the rivets and double riveting are to be regulated by the thickness of the thicker plating.

3. No plates to be less in length than six spaces of frames, except the fore and after lengths.

4. No butts of outside plating in adjoining strakes to be nearer each other than two spaces of frames ; and the butts of the alternate strakes not to be under each other, but shifted not less than one frame space.

5. The butts of the upper or main deck, and of spar deck stringer plates, in all cases to be shifted not less than two spaces of frames clear of the butts of the sheerstrakes.

6. The butts of the garboard strakes to be shifted clear of the keel scarphs, and not to be nearer each other on opposite sides of the vessel than two spaces of frames.

7. All butts of plating, where practicable, to be planed and fitted close ; the edges of the plating to be sheared from their faying surfaces, or the burr caused by shearing to be carefully chipped off, and all outside edges of plating are to be either planed or chipped fair. The butts and edges to be carefully caulked.

8. The breadth and thickness of the sheerstrakes and garboard strakes to be as given in Table S 2.

9. The sheerstrakes in one, two, and three decked, and spar-decked vessels to be fitted sufficiently high above the upper deck beam ends, so as to take at least two rows of rivets vertically in the butts above the upper flange of the gunwale angle bar.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have the butt-strap double or treble riveted, as may be required by Section 20, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges.

10. The boss-plates covering the screw shaft are to be the same thickness as the strakes amidships of which they form part where the number for plating is under 13,900; if that number and under 18,700, the plates are to be $\frac{1}{20}$ of an inch thicker; and if the number is 18,700 and under 26,500, the plates are to be $\frac{1}{20}$ of an inch thicker than the midship plating, and the butts treble riveted; and where the number is 26,500 and above, the boss-plates and the plates above and below the same to be $\frac{2}{20}$ of an inch thicker than the midship plating, and their butts double strapped, or lapped and treble riveted; or the boss plates are to be doubled.

11. When plates forming the outside strakes of plating are above 40 inches but not exceeding 46 inches, or those forming the inside strakes are 48 inches in breadth and not exceeding 54 inches, their butts are to be treble riveted with straps $\frac{1}{20}$ of an inch thicker than the plates they connect. Where the butt-straps of such strakes are required by Section 20 to be treble riveted, the straps required by that section should be of this increased thickness excepting where the straps are therein required to be $\frac{4}{20}$ of an inch thicker than the plates.

12. Where gutter waterways are adopted at the upper deck, the butt-straps of the bulwark plating are to be sufficiently broad to receive the spur in the middle of the bulwark stay; and when the plates do not exceed 12 feet in length they are to have stays fitted against the butt-straps, and an intermediate stay is to be fitted between the butts on straps or doubling plates. In no case are the stanchions which support the bulwarks to be more than 6 feet apart, and in sailing vessels of 1,800 tons and above, the spacing is not to exceed 4 to 5 feet apart; the heel of each stanchion to be attached by not less than four $\frac{7}{8}$ inch bolts, tapped through the stringer plate, and secured with a nut and grummet. Their size may be from $1\frac{5}{8}$ in. to 2 in. in diameter, regulated by the length of the stanchion and the size of the vessel. Other forms of stanchions may be adopted, provided they be submitted for approval.

BUTT-STRAPS AND LINING PIECES.

Section 20. 1. In vessels whose plating number does not exceed 8,000, the butt-straps of the sheerstrake, deck stringer plate, and one strake at the bilges for half the vessel's length amidships are to be $\frac{1}{20}$ of an inch thicker than the plates they connect, and to be double riveted.

2. When the plating number is above 8,000 and not exceeding 13,000, the butt-straps of the sheerstrake, deck stringer plate, and two strakes round the bilges are to be $\frac{2}{20}$ of an inch thicker than the plates they connect, for half the vessel's length amidships, and treble riveted.

3. When the plating number is over 13,000 and not exceeding 16,000, an additional strake of bilge plating is to be treble riveted at the butts for half the length amidships with straps $\frac{2}{20}$ of an inch thicker than the plates they connect.

4. When the plating number is over 16,000 and not exceeding 20,000, the butts of the sheerstrake, deck stringer plate, three strakes of bilge plating, and the remaining outside strakes of plating are to be treble riveted with straps $\frac{2}{20}$ of an inch thicker than the plates they connect, for half the vessel's length amidships.

5. When the plating number is above 20,000 and not exceeding 24,000, all the butts, including those of the upper and middle deck stringer plates, are to be treble riveted for half the vessel's length

amidships with straps $\frac{3}{20}$ of an inch thicker than the plates they connect, with the rivets in the back row spaced 5 to $5\frac{1}{4}$ diameters apart ; and the remaining butt-straps to be $\frac{2}{20}$ of an inch thicker than the plates.

6. In addition, in vessels where the plating number is 20,000 and under 28,000, the butts of the upper deck stringer plate are to have double straps for half the vessel's length amidships ; the thickness of the straps to be as given in paragraph 14 of this section, or, the butts may be lapped and treble riveted : but where the plating number is 28,000 and above, double butt straps are to be fitted to the stringer plates for half the vessel's length.

7. When the plating number is above 24,000 and not exceeding 28,000, all the butt straps, including those of the upper and middle deck stringer plates, are to be treble riveted for three-fourths the length amidships with the back row of rivets spaced 5 to $5\frac{1}{4}$ diameters apart. The butt-straps for half the length amidships to be $\frac{4}{20}$ of an inch thicker than the plates ; and the remaining butt-straps $\frac{2}{20}$ of an inch thicker than the plates.

8. When the plating number is above 28,000, the whole of the butt straps all fore and aft including those of the upper and middle deck stringer plates, are to be treble riveted with the back row of rivets spaced 5 to $5\frac{1}{4}$ diameters apart, and to be $\frac{4}{20}$ of an inch thicker than the plates they connect for three-fourths the length amidships, and $\frac{2}{20}$ of an inch at the ends. In vessels of this size and exceeding 12 depths in length, double butt-straps to be fitted to the sheerstrake and strake below, or other equivalent strength supplied to the satisfaction of the Committee. (*See* also footnote on Table S 6.)

9. The butt-straps of flat keel plates are to be treble riveted, and as much thicker than the plates they connect as is required for bilge strakes.

10. The rivets in the butt straps of outside plating and the upper and middle deck stringer plates to be spaced not more than $3\frac{1}{2}$ diameters apart from centre to centre, except in the back rows in treble riveted butt-straps, which are to be spaced 5 to $5\frac{1}{4}$ diameters.

11. When plates forming the outside strakes of plating are above 40 inches, but not exceeding 46 inches, or those forming the inside strakes are 48 inches in breadth and not exceeding 54 inches, their butts are to be treble riveted with straps $\frac{1}{20}$ of an inch thicker than the plates they connect. Where the butt-straps of such strakes are required by the preceding paragraphs to be treble riveted, they should be of this increased thickness, excepting where the straps are therein required to be $\frac{4}{20}$ of an inch thicker than the plates.

12. All butt-straps to be of the breadth given in Table S 8, and in no case, where single, to be less in thickness than the plates they connect.

13. Where the butts of plating are overlapped, the width of the laps and the riveting of the same are to be as given in Table S 8. In vessels where the plating number is under 16,000, the lap butts of the outside plating for one-half of the vessel's length amidships are to be treble riveted, and the remaining butts double riveted, and where the plating number is 16,000 and above, the lap butts are to be treble riveted throughout. The treble riveted butts to have three complete rows of rivets.

14. Where double butt straps are fitted to stringer plates, sheerstrakes, and outside plating, the thickness of straps to be as given in the following table.

Thickness of Plating.	Strap which is countersunk for rivets.	Strap on opposite side of Plate.
Inches.	Inches.	Inches.
$\frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$
$\frac{10}{20}$	$\frac{8}{20}$	$\frac{6}{20}$
$\frac{11}{20}$	$\frac{8}{20}$	$\frac{7}{20}$
$\frac{12}{20}$	$\frac{9}{20}$	$\frac{7}{20}$
$\frac{13}{20}$	$\frac{10}{20}$	$\frac{8}{20}$
$\frac{14}{20}$	$\frac{10}{20}$	$\frac{9}{20}$
$\frac{15}{20}$	$\frac{11}{20}$	$\frac{9}{20}$
$\frac{16}{20}$	$\frac{12}{20}$	$\frac{10}{20}$
$\frac{17}{20}$	$\frac{12}{20}$	$\frac{11}{20}$
$\frac{18}{20}$	$\frac{13}{20}$	$\frac{11}{20}$
$\frac{19}{20}$	$\frac{14}{20}$	$\frac{12}{20}$
$\frac{20}{20}$	$\frac{14}{20}$	$\frac{13}{20}$
$\frac{21}{20}$	$\frac{15}{20}$	$\frac{13}{20}$
$\frac{22}{20}$	$\frac{15}{20}$	$\frac{14}{20}$

Lining Pieces.

15. The space between the plating and the frames to have solid filling or lining pieces in one length, closely fitted ; to be of the same breadth as the frames, excepting in way of bulkheads, where they are to be fitted as stated in Section 22, paragraph 6.

RIVETING AND RIVETS. (See also Tables S 8 and S 8A.)

Section 21. 1. **Workmanship.**—The work is to be carefully closed with nut and screw bolts before the riveting is commenced. Unfair holes are to be properly rimed out and re-countersunk if necessary, and not to be cut with a chisel or unduly drifted. The rivets are to be properly staved up so as to completely fill the holes, their heads are to be "laid up" close, and the points or outer ends are to be left full and are not to be below the surface of the plating. The Surveyors are to see that the rivet holes are properly formed, and the "burr" caused by punching must be removed before the parts are fitted together for riveting. The rivet holes are to be regularly and equally spaced and carefully punched from the faying surfaces, opposite each other in the adjoining parts, laps, lining pieces, butt straps and frames. The rivet holes in frames at the turn of the bilge are not to be punched until the frames are bent to the required shape ; the holes in way of the lands of the plating are to be drilled or "beared" after the frames are faired in place, and the plate edges lined off.

2. **Quality and Testing of Rivets.**—Rivets, whether of iron or steel, are to be of the best quality, and the Surveyors are to test samples of the rivets when delivered in the shipyards where they are to be used.

3. **Form of Rivet.**—The rivets are to be in diameter as required by Tables S 8 and S 8A, and to be increased in size under their heads to fill the rivet holes. Those used for outside plating are to be of the form shown in Table S 8A.

4. **Countersinking.**—The countersinking of the rivet holes is to extend through the whole thickness of the plate or angle when the thickness is less than $\frac{14}{20}$ of an inch, and when the thickness is $\frac{14}{20}$ of an inch or above the countersinking is to extend through nine-tenths the thickness of the plate. The size of the countersink is to be in accordance with the figured dimensions shown on Table S 8A.

5. **Arrangement of Rivets.**—The size and spacing of the rivets in the various parts of the structure are to be in accordance with the requirements of Tables S 8 and S 8A. The butts of outside plating, and all double and treble riveting, except in the keel, stem and sternpost are to be chain riveted. The keel, stem and sternpost, the butts of outside plating, deck stringers and tie plates on beams, keelsons, stringers and all longitudinal ties, are to be at least double riveted in all vessels. The butts of deck plating are to be at least double riveted for half the length amidships. The butts and edges of the plating of watertight bulkheads may be single riveted, except the seam connecting the bulkhead plating to floor plate, which must be double riveted.

6. **Number of Rows of Rivets in Seams of Outside Plating.**—The landing edges of outside plating when $\frac{7}{20}$ of an inch in thickness and above from the keel to the upper turn of bilge and of the sheerstrake in all cases, and when $\frac{9}{20}$ of an inch and above from the upper turn of bilge to the gunwale, must be double riveted ; below these thicknesses the edges may be single riveted. The thicker of the two plates is to regulate the size of the rivets and the requirements as to double riveting. When the plating is of a thickness amidships to require the edges to be double riveted the same is to be continued all fore and aft. In vessels of 480 feet in length and upwards, the landing edges are to be treble riveted for one-fourth of the vessel's length in the fore and after bodies for a depth of one-third the depth of the vessel, the actual position of this treble riveting to depend upon the arrangement of shell plating and the special design of the vessel, or other equivalent strengthening to be afforded. Vessels of from 450 feet to 480 feet in length are to be additionally riveted at the before mentioned parts proportionately to their length, or to have other equivalent strengthening. Each case requiring this additional riveting of the seams is to be submitted for the approval of the Committee.

7. **Spacing of Rows of Rivets.**—The breadth of butt straps, butt laps and edge laps are to be in accordance with the requirements of Table S 8. The rivets are not to be nearer the butts or edges of the plating, butt straps, butt laps or of any angle bar than a space equal to their own diameter. In edge riveting the space between any two consecutive rows of rivets must not be less than once and a half their diameter. In butt straps the space between any two rows must not be less than twice the diameter of the rivets, and in butt laps the space between consecutive rows is not to be less than two and a half times the diameter of the rivets.

8. **Doubling Plates.**—When plates have to be doubled the butts of these plates and of the doubling plates are to have the buttstraps double or treble riveted, as may be required by Section 20. These doubling plates are to be well riveted at the edges and middle of the plates between the frames, in addition to the rivets which pass through the frames, and the middle of the plates are to be riveted up before the edges.

BULKHEADS.

Section 22. 1. Screw steamers are to have a watertight bulkhead at each end of the engine and boiler space. In addition a watertight collision bulkhead is to be fitted at not less than one-twentieth of the vessel's length abaft the stem at the lower deck, and a watertight bulkhead is also to be fitted at a reasonable distance from the after end of the vessel. In all cases the foremost or collision bulkhead is to extend from the floor plates to the upper, spar, or awning deck, and its water-tightness is to be tested by filling the peak with water to the height of the load line. Where the machinery is fitted aft in vessels 220 feet and under 280 feet long, a watertight bulkhead is to be fitted about midway between the collision bulkhead and the bulkhead at the fore end of the engine and boiler space.

2. In steamers 280 feet and under 330 feet in length, an additional watertight bulkhead is to be fitted in the main hold about midway between the collision and boiler room bulkheads. In steamers 330 feet and under 400 feet in length, an additional watertight bulkhead is to be fitted in the after hold; in steamers 400 feet and under 470 feet in length, *seven* watertight bulkheads are to be fitted; in steamers 470 feet and under 540 feet in length, *eight* watertight bulkheads are to be fitted, and in steamers 540 feet and under 600 feet in length, *nine* watertight bulkheads are to be fitted. These bulkheads are to extend to the height of the upper deck in vessels with one, two, or three decks, to the spar deck in spar deck vessels, and to the main deck in awning or shelter deck vessels. In awning or shelter deck vessels, or vessels with a continuous superstructure or bridge house, a deep web frame or partial bulkhead is to be fitted on each side in the 'tween decks, over each of the watertight bulkheads which extend only to the main deck.

3. When a bulkhead is not completed at one pair of frames from the floor-plate up to its prescribed height per rule, but is recessed, stepped, or stopped at an intermediate part, the water-tightness is to be completed with collars or chocks forming a "metal to metal" connection, to the exclusion of cement, wood, &c. The bulkheads to be connected to the decks and to double bottom plating by double angles of the size of the reversed frame, and to be extended to the outside plating by a watertight sub-division at or near each bulkhead required by Rule.

4. The engine-room bulkheads to extend from the floor-plates to the upper deck, in vessels with one, two, or three decks; and to the spar deck in spar-decked vessels, and main deck in awning-decked vessels. The aftermost bulkhead will be required to extend to the height of the upper or spar deck, unless a different arrangement of bulkheads be approved by the Committee. This bulkhead is to be made watertight by a stuffing box where the screw shaft passes through, and its water-tightness is to be tested by the after compartment being filled with water to the height of the load line.

5. In sailing vessels the foremost or collision bulkhead only will be required.

6. All plating of bulkheads to be of the thickness prescribed in Table S 1, fitted between two frames at each side of the vessel and to be strongly riveted to them, and to be connected to the floor plates by a double row of rivets. Doubling plates between frames and outside plating in way of bulkheads, are to extend in one piece from the foreside of the frame afore to the aftside of the frame abaft the bulkhead frames, or they may be of an approved diamond shape, fitted and riveted as shown in sketch. (*See* page 157.) These doubling plates may be dispensed with, provided the transverse watertight bulkheads are connected to the sides of the vessel by means of brackets of the dimensions

shown by the sketch on page 158, fitted at each side stringer and hold stringer. But when the side and hold stringers of vessels with deep frames, web frames, or ordinary frames, are spaced more than five feet apart, and the bulkhead liners are omitted, additional but smaller brackets are to be fitted connecting the bulkhead and the side plating, so as not to exceed that spacing.

7. The bulkheads to be supported vertically on one side and horizontally on the other, with angle bars of not less size than required for the main frames. The vertical angles to be not more than 2 feet 6 inches apart, and their lower ends to extend well down over the floor plates; or, where a double bottom is fitted, they are to be connected to the inner bottom plating by plate brackets. The horizontal stiffeners are not to exceed 4 feet apart, below where the bulkhead is supported by a laid deck, and, when of bulb angle, they are to be attached with brackets to the vessel's sides. In all collision bulkheads, and other bulkheads of 40 feet and above in breadth, the horizontal stiffeners are to be of bulb angles, one inch deeper than required by Table S 1, for bulb angle frames. All bulkheads of 36 feet and under 45 feet in breadth to be additionally stiffened by a vertical web at the middle line, extending from the keelson to the hold or lower deck beams. Bulkheads of 45 feet and under 55 feet in breadth, to have two vertical webs, and bulkheads of 55 feet and under 60 feet in breadth to be fitted with three vertical webs.

8. In vessels of a depth to require lower deck, hold, or orlop beams, when the bulkheads are not supported on both sides by a lower or orlop deck, they are to be additionally supported by a semi-box beam of the scantlings required by Table S 4 for such beams; the same to be fitted in way of the hold or orlop stringer plate, or the side stringer midway between the floor plates and the lowest laid deck.

9. All such bulkheads to be caulked and made thoroughly watertight, and to be tested by water from a hose, if considered necessary by the Surveyors, to ensure that they are watertight.

10. When a recess extending above the hold beams is formed in the engine room bulkheads the bulkhead is to be efficiently connected from side to side by a tie or bridle beam at about the height of the hold beams, strongly riveted to the plating and fitted with efficient gusset plates.

DECKS.

WOOD DECKS.

Section 23. 1. The flat of decks, if of wood, to be of good quality, properly seasoned, free from sap and objectionable knots; the thickness and fastenings as per Table S 3.

2. Pine planks for weather decks should not be laid within a period of from four to six months (according to their thickness) after being cut; and where pitch pine is used for weather decks, the breadth of the planks should not exceed 5 inches, and the period of seasoning should not be less than six months.

3. Oregon pine of good quality will be admitted for decks of vessels, provided it be laid with the grain vertical, and the width of planks and period of seasoning be as required for pitch pine.

4. The above required periods of seasoning will not be necessary in cases where satisfactory artificial means of seasoning are adopted.

5. The Surveyors must ascertain that the requirement as to the seasoning has been complied with, and special attention should also be directed to the laying of the decks and to the caulking of the seams and rents.

6. When gutter waterways are adopted at the upper deck, the angle bar forming the inner edge of waterways is not to be less in thickness than

$\frac{10}{20}$ where the thickness of the deck is 4 inches
$\frac{9}{20}$,, ,, ,, ,, $3\frac{1}{2}$ inches
$\frac{8}{20}$,, ,, ,, ,, 3 inches

7. In all cases the margin or boundary planks of weather decks to be either Teak or Greenheart.

8. If the deck is of teak, the thickness to be as prescribed in Table S 3.

9. When the deck planks are 6 inches in width or under, single fastening will be sufficient; but when they are above 6 inches and not exceeding 8 inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding 8 inches in width must be double fastened with nut and screw bolts.

10. The upper deck to be fastened by galvanised screw bolts with nuts at the under side of the angle bar of the beams and tie-plates. The bolts must be properly sunk, with oakum and white lead, under their heads, and be carefully covered over with turned dowels bedded in white lead, marine glue or some suitable composition.

11. Where diagonal plates are fitted on the beams, the deck planks to be scored over the diagonal plates, so as to fit close on the beams, thereby avoiding the use of wood pads.

12. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it must be renewed, unless it be found on survey to be in good condition, when on application the case will receive the consideration of the Committee.

STEEL DECKS. (See also Table S 5.)

13. Where steel or iron decks are fitted less than $\frac{8}{20}$ or $\frac{7}{16}$ of an inch in thickness respectively, and no wood is laid, beams as required by Table S 4 and S 4A, are to be fitted to every frame, but at the ends of the hatchways, exceeding six frame spaces in length, the beams are to be of size required by Sec. 13, par. 7.

14. Where steel or iron decks are $\frac{8}{20}$ or $\frac{7}{16}$ of an inch in thickness respectively, or above, beams of the size required by Table S 4 may be fitted to alternate frames, but beams fitted to every frame are considered preferable. Beams are to be fitted to every frame at iron or steel awning, part awning, shelter or bridge decks. Where no wood deck is to be laid on a steel or iron deck, half-beams are to be fitted to every frame in the way of all hatchways, including those of engine and boiler openings.

15. When the deck plating is $\frac{7}{20}$ to $\frac{9}{20}$ of an inch in thickness amidships it may be reduced $\frac{1}{20}$ of an inch before and abaft the midship half length. When $\frac{10}{20}$ of an inch thick amidships it may be reduced $\frac{1}{20}$ of an inch for one-eighth the length before and abaft the half length amidships, and the remaining plates $\frac{2}{20}$ of an inch from the midship thickness.

16. Where a steel deck is required to be fitted by the rules, and is severed at the break, its continuity of strength is to be maintained by efficient brackets securely attached to the break bulkhead and to the deck plating before and abaft the same, or otherwise arranged to the satisfaction of the Surveyors.

17. If a wood flat be laid over an iron or steel upper deck, the thickness should not be less than 3 inches if of pine and $2\frac{1}{2}$ inches if of teak, and it should be efficiently secured between the beams to the deck plating. Steel or iron decks are not to be reduced in thickness from that given by Table S 5, when sheathed with wood.

18. All decks of steel or iron are to be caulked, unless sheathed by a properly caulked wooden deck

19. The butts of the steel deck to be double riveted for half the length amidships; and where large openings are cut in deck plating compensation is to be given for the same.

20. Where steel or iron decks are fitted as required by the Rules the thickness of the plating must be increased so as to efficiently maintain the strength of the deck in way of all hatchways and engine and boiler openings, and, in addition, doubling plates are to be fitted at the corners of all large deck openings, or the deck plating increased in thickness equivalent to the doubling plate.

21. If a wood flat be laid over a steel or iron middle deck it may be $2\frac{1}{2}$ inches in thickness.

22. Where a vessel has a steel deck for half her length amidships, or beyond, but not a complete steel deck, or where there are one, two, or three steel decks; or one, two, or three steel decks, and in addition a partial steel deck, as before described, the same will be inserted in the Register Book thus— pt steel dk; 1 steel dk; 1 steel & pt steel dk; 2 steel dks; &c., &c., as the case may be.

23. Iron decks will be admitted in lieu of steel decks provided the thickness of the plating be in as many sixteenths of an inch as Table S 5 requires in twentieths for steel decks, when a notification of the same will be made in the Register Book, such as 1 iron deck, &c., as the case may be.

24. All upper and weather decks of new vessels, of whatever material they are constructed, are when complete to have their watertightness tested by a hose in the presence of the Surveyors, who are to state in their First Entry Report the results of such tests.

25. All gutterways of new vessels are to be tested by being flooded with water where possible to ensure watertightness, and the Surveyors are to state in their First Entry Report the results of such tests.

DOUBLE BOTTOMS AND WATER BALLAST TANKS.—(*See also Tables* S 7 *and* S 7A.)

Section 24. 1. **Notification in Register Book.**—Vessels fitted with a double bottom or other tanks forming part of the structure and intended for the purpose of water ballast, will have the same denoted in the Register Book, together with their length and capacity. (*See* Key to Register Book.)

2. **Scantlings and attachments.**—The scantlings, riveting and attachments of the various parts forming the double bottom are to be as required by Tables S 7 and S 7A.

3. **Side keelsons and part double bottoms.**—Where part double bottoms are fitted, the side keelsons are to extend into or scarph the double bottom not less than three spaces of frames, and be connected to the longitudinal girders where practicable. Where double bottoms are fitted in the fore and after holds and not extended through the engine and boiler space, care is to be taken to provide against an abrupt termination in the longitudinal strength. The girders are either to be carried through the engine and boiler space, or connected with longitudinal engine and boiler bearers, or otherwise arranged to the satisfaction of the Surveyor.

4. **A "Well" to be formed in engine-room.**—Where a double bottom extends through the engine and boiler space, a well should be formed between the engine-room after bulkhead and the floor

immediately before the same, for the drainage of water; or open gutter ways of sufficient size should be made in the wings, so as to be always accessible.

5. **Side girders.**—Side girders in a double bottom are to be extended as far forward and aft as accessibility to all parts will admit. The girder nearest the middle line is to be extended to the collision bulkhead, except where fineness of the form of a vessel renders this unnecessary for the efficient stiffening of the bottom plating.

6. **Strengthening at fore end in vessels of full form.**—Forward of the three-fifths length in steamers having a tonnage co-efficient of ·78 or above, or having a full form at the fore part, the frames are to be doubled from margin plate to margin plate to the rule position of the collision bulkhead; and where the double bottom is constructed with floors to every frame, additional intercostal keelsons or girders of one-half the depth of the centre girder are to be fitted, extending as far forward as practicable. Where the double bottom is constructed with floors at alternate frames and with the floor plates fitted to every frame forward of the three-fifths length, additional girders need not be fitted at that part provided the ordinary side girders extend as far forward as practicable. The two strakes of outside plating on each side next the garboards are to have the midship thicknesses maintained forward to the collision bulkhead.

7. **Double reversed frames in machinery space.**—Double reversed angles are to be fitted on every floor in engine space, and on each floor in way of boiler bearers. They are to extend in all cases from margin plate to margin plate.

8. **Free passage of air between divisions.**—It is of importance that ample provision should be made for the free passage of air from one division to another, so that it may readily find its way to the air pipes. This should be done by fitting the liners short, setting down the angle bar from the inner bottom or top of deep tank wherever necessary, and leaving, otherwise, a sufficient number of holes as near to the inner bottom as practicable. The air pipes should also be sufficient in number and size; and, wherever necessary, one should be fitted at each end of each tank on both sides of the vessel.

9. **Tank side brackets and angles.**—Bracket plates are to be fitted outside the double bottom, riveted to the margin plate and to every frame all fore and aft. They are to extend up the bilges to a perpendicular height above top of keel of twice the midship depth of ordinary floors, except where deep framing is fitted when they are to be two and a half times the depth. The bracket plates are to maintain the height prescribed for one-half the vessel's length amidships, except in vessels of fine form in which cases proposals should be submitted to the Committee. From the one-half length the height may be gradually reduced to the level of the inner bottom at the ends of the vessel. The breadth of the bracket plate at the ship's side and its rivet attachment to the frame angle must, however, in no case be less than its breadth and attachment at the margin plate. The angle bars connecting outside bracket knees to the margin plate are to be fitted on the same side of the bracket plates as the corresponding angles connecting the floor ends or inside brackets to the margin plate.

10. **Margin plates.**—The margin plate is to be efficiently connected to the outside plating and frames of the main body of the vessel. When gusset plates or other ties are fitted connecting the outside bracket knees to the inner bottom, the horizontal flanges of the margin plates are to be of sufficient width to admit of the gusset plates being efficiently fitted and riveted clear of the landing edge of the inner bottom, and the upper surface of the reversed frames on top of the outside bracket knees should be fair with the top of the inner bottom.

11. **Manholes and covers.**—Manholes, with wrought iron or steel covers, must be constructed so as to enable the inner surfaces of outside and inner bottom plating, the frames, floors, girders, and rivets to be thoroughly examined and coated when required, and where the manhole covers are attached by bolts to the inner bottom plating, doubling plates or rims are to be fitted to receive the fastenings of the covers. Manholes are not to be cut in the centre girder. The manholes in the floor plates, side girders, and inner bottom plating, are to be no larger and not more numerous than necessary to render all parts of the double bottom readily accessible. The edges of the manholes should be smooth to enable them to be entered with facility.

12. **Attachment of bulkheads to inner bottom.**—The bulkheads are to be connected to the inner bottom plating by double angle bars of the size required for the reversed frames, and to be caulked and made water-tight.

13. **Workmanship and testing.**—All water-tight joints are to have the surfaces of steel fitted close to each other and caulked, without, as far as practicable, the use of felt, canvas, &c. The double bottom is to be caulked and made water-tight, and each compartment intended for water ballast is to be tested on completion with a head of water at least equal to the extreme draught of water of the vessel.

14. **Ceiling.**—The ceiling on the double bottom of a cargo hold may be omitted, except under the hatchways and over the limbers at the bilges. Where the upper side of the plating is protected with wood ceiling it should be $2\frac{1}{2}$ inches thick and laid on battens $1\frac{1}{2}$ inches thick, to admit of drainage water passing to the wells, unless the ceiling be laid on the top of the inner bottom embedded in a substantial covering such as Stockholm tar and cement. The ceiling on double bottoms to be removed when the tanks are required by the Rules to be tested.

15. **Alternative arrangements.**—Any other plan of fitting double bottoms than those hereafter referred to may be adopted, provided in the first instance it receives the approval of the Committee. No class will be assigned to vessels having a double bottom, or part double bottom, unless such double bottom, or part double bottom, be constructed in accordance with the requirements of the Rules or of strength equal to that prescribed thereby.

16. **Deep tanks.**—Where deep water ballast tanks are fitted their water-tightness is to be tested by a head of water 8 feet above the crown of the tank, but not less in any case than the height of the load water line.

17. **Peak tanks.**—A wash plate is to be fitted in the peaks when used for water ballast, and the tanks are to be subjected to the test of a head of water of 8 feet above the crown, but not less in any case than the height of the load water line.

Attachment where frames and reversed frames are cut at the tops of peak tanks of ordinary length.

Frame Number.	Depth of bracket measured from outside plating.	Number of Rivets.
31 and under 57	15 inches.	4 of $\frac{5}{8}$ inch.
57 ,, ,, 71	18 ,,	4 ,, $\frac{3}{4}$,,
71 ,, ,, 80	21 ,,	5 ,, $\frac{3}{4}$,,
80 ,, ,, 97	24 ,,	6 ,, $\frac{3}{4}$,,
97 ,, ,, 115	27 ,,	7 ,, $\frac{3}{4}$,,
115 ,, ,, 130	30 ,,	7 ,, $\frac{7}{8}$,,

Brackets are to be fitted at every frame of the same thickness as the frame, and are to be attached to the tank top plating by means of single angles of the size required for lower deck stringer angles.

Where only the reversed frames are cut, and not the frames, the bracket attachments as above are to be fitted to alternate frames.

Alternative arrangements of equal efficiency to the above will receive the Committee's approval.

CELLULAR DOUBLE BOTTOMS WITH A FLOOR PLATE FITTED AT EVERY FRAME.

18. **Construction.**—Where double bottoms are constructed with floor plates, lightened with manholes, fitted to every frame, and continuous in one length from the middle line to the margin plate, intercostal side girders are to be fitted between the centre girder and margin plate, in accordance with the requirements of Table S 7, well connected to the floors and to the inner and outer bottom plating.

19. **Additional girders in way of engines.**—In way of the engines additional intercostal girders are to be fitted, the number of girders to be as required by Table S 7, for floors on alternate frames.

20. **With hanging keel.**—If a hanging keel be fitted it should be formed by the vertical centre plate being extended down and riveted between two side bars, the three thicknesses to equal the thickness required for bar keels, or as otherwise approved.

21. **Frame angles on floors.**—The vertical flange of the frame angles which are attached to the floors may be of the same size as the horizontal flange required for ordinary frames by Table S 1.

22. **Inner bottom plating.**—The inner bottom plating is to be continuous and wrought longitudinally. The butts to be shifted well clear of each other and the edges to be shifted well clear of the girders.

23. **Outside plating in way of double bottom.**—In this system of construction the outside plating (except the garboard strakes and flat keel plates), which is entirely within the boundary of the double bottom, may be $\frac{1}{20}$th of an inch less in thickness than that prescribed in Table S 2, provided that thickness be $\frac{11}{20}$ths of an inch or above.

CELLULAR DOUBLE BOTTOMS WITH FLOOR PLATES FITTED AT ALTERNATE FRAMES.

24. **Construction.**—Where double bottoms are constructed with floor plates lightened with manholes, fitted to alternate frames, side girders are to be fitted in accordance with the requirements of Table S 7, well connected to the floors and to the inner and outer bottom plating. In all cases floor plates are to be fitted under the boiler bearers, also to every frame in the engine space and from the three-fifths length amidships to the collision bulkhead. Where the plating number exceeds 50,000 the double bottom is to be constructed throughout with a floor plate at every frame and with longitudinal girders as required for that system of construction.

25. **With a hanging keel.**—If a hanging keel be fitted it should be formed by the vertical centre plate being extended down and riveted between two side bars, the three thicknesses to equal the thickness required for bar keels, or as otherwise approved.

26. **Intermediate frames and reversed frames.**—Intermediate frames and reversed frames of the size given in Table S 1 are to be fitted for stiffening the outside plating and tank top, unless the

longitudinal girders are more closely spaced than required by Table S 7, or the inner bottom plating be increased $\frac{1}{20}$th of an inch in thickness, when the intermediate reversed angles may be dispensed with.

27. **Bracket plates on intermediate frames.**—In all vessels, bracket plates are to be fitted to the centre girder and margin plates at the intermediate frames inside the double bottom, and where the plating number is 38,000 and under 50,000 the brackets are to be of sufficient breadth at the top to take three rivets in the vertical flange of the intermediate reversed angles, for $\frac{3}{5}$ths the vessel's length amidships.

28. **Frame angles on floors.**—The vertical flange of the frame angles which are attached to the floors may be of the same size as the horizontal flange required for ordinary frames by Table S 1.

29. **Inner bottom plating.**—The inner bottom plating is to be continuous and wrought longitudinally. The butts to be shifted well clear of each other and of the butts of the longitudinal girders, and the edges to be shifted well clear of the latter.

30. **Outside plating in way of double bottom.**—In this system of construction no reduction of thickness in the plating from the requirements of Table S 2 will be allowed.

DOUBLE BOTTOMS FORMED WITH GIRDERS ON TOP OF ORDINARY FLOORS.

31. **Construction.**—Where double bottoms are fitted with longitudinal girders extending on top of ordinary floors the girders must be spaced not more than three feet apart with a continuous angle on the upper and lower edges, and in addition to be connected by angle lugs on the floors and girders. Side intercostal plates or side keelsons need not be fitted in the range of double bottom except where the breadth of the vessel exceeds 46 feet.

32. **Accessibility.**—The height of the tank top above the floors to be at least sufficient for easy access and examination of the inside of tank.

33. **Floor plates and frames.**—The floor plates, frames and reversed frames, are to be of the sizes required by Table S 1.

34. **Floor end brackets.**—Bracket plates are to be fitted inside the double bottom attaching the margin plate to every floor plate.

35. **Outside plating in way of double bottom.**—In this system of construction the outside plating (except the garboard strakes and flat keel plates) which is entirely within the boundary of the double bottom may be $\frac{1}{20}$th of an inch less in thickness than that prescribed in Table S 2, provided that thickness be $\frac{11}{20}$ths of an inch or above.

CEILING.

Section 25. 1. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed; but the ceiling on the double bottom of a cargo hold may be omitted, except under the hatchways and over the limbers at the bilges.

2. The ceiling on the floors of vessels not having double bottoms should be made in hatches where practicable, of convenient sizes, and when not so arranged, to be fastened to the reversed angle bars or

frames in such a manner as to be removed when required for the purpose of survey, or for cleaning and painting.

3. For thickness of ceiling, *see* Table S 3.

4. Cargo battens to be fitted from the upper part of the bilges upwards, including the 'tween decks of all types of vessels, and in permanently enclosed spaces in bridge houses, poops and other deck erections. In spaces exclusively intended for carrying coal, cargo battens may be dispensed with.

5. Vessels exclusively engaged in carrying coal, ore or wood, need not have cargo battens fitted, but in each such case the certificate of classification will have the following words written on it, "Subject to the vessel being engaged exclusively in carrying coal, ore, or wood, while without cargo battens."

ENGINE AND BOILER SPACE.

Section 26. 1. **Engine and Boiler bearers.**—In steam vessels care must be taken that the engine and boiler bearers are properly constructed, and fitted with efficient longitudinal ties. Where the bearers interfere with the longitudinal strength of the vessel, they must extend a sufficient distance beyond the bulkheads of the engine and boiler space to compensate for the same.

Where it is intended to fit engines of greater power than in ordinary cargo carrying steamers, the engine seating is to be of proportionately greater strength, and to be specially adapted with this object in view by being connected to the sides of the vessel. Other means are, if necessary, to be adopted in order to ensure the rigidity and strength necessary to withstand the vibration produced in this part of the vessel and the after lengths of outside plating attached to the stern-frame are to be of not less thickness than the plates in the same range amidships.

2. **Strengthening at after end of vessel.**—The after floor-plates are to be extended well above the screw-shaft. In all cases wherein the garboard plates are connected to the stern-frame, and in cases where the plating number is 16,600 or above, the after lengths of plating so connected are to be of the thickness required for the same strakes amidships. The boss plates are to be as required by Section 19, paragraph 10; and in single screw steamers above 350 feet in length, the after lengths of outside plating are to be connected to the portion of the stern-frame below the boss with three rows of rivets. Great care must be bestowed in ensuring sound riveting and workmanship at this part and the after frames are to be sufficiently apart transversely to admit of this being effected.

3. **Strengthening in Machinery Space.**—In the engine and boiler space, double reversed angles must be fitted to every floor, from bilge to bilge, except in way of double bottoms where they are to be fitted from margin plate to margin plate in engine space and under boiler bearers. In vessels where the number for plating is 15,000 and above (excepting in way of double bottoms), or the depth from the top of keel to top of hold beams is 17 feet or above, the double reversed angles are to extend sufficiently high to admit of the bilge stringer angles being riveted to them, unless the bilges are otherwise additionally strengthened by web-frames, or deep framing, beyond the requirements of the Rules. In vessels except those having deep framing where the number is 16,000 and under 18,000, not less than three web-frames are to be fitted on each side, formed of plates of not less than the thickness of

the frames, and of the breadth specified in Section 14a. These are to scarph the ends of the floors, and extend to the upper or spar deck. Where the number is 18,000 and under 30,000 these web-frames are not to be more than from four to five frame spaces apart, and where the number is 30,000 and above they are not to exceed four frame spaces apart. When hold beams are omitted in the engine and boiler space the web-frames are to be closer spaced than above described. The web-frames are to be fitted in way of the deck beams when practicable, and if fitted between the beams they are to be connected to the stringer plate by bracket knees above and below the same. In vessels with deep framing fitted in accordance with the Rules, the web frames in the engine and boiler space may be spaced about ten frame spaces apart. Where continuous bilge or side stringer bars pass through the web-frames efficient compensation is to be introduced in way of the same. Where it is desired to adopt other plans than the foregoing for maintaining the necessary rigidity in the engine and boiler space, sketches of the same must be submitted for the approval of the Committee.

4. **Strong beams.**—As many upper, middle, and hold or lower-deck beams of extra strength, having double angles at upper and lower edges of the sizes as per Table S 4, are to be introduced in the engine and boiler space as may be practicable. (*See* Section 14, paragraph 32.)

5. **Clearance between bulkheads and boilers.**—Coal bunker bulkheads are to be kept well clear of the boilers and their uptakes. Where the boiler room bulkhead is recessed for a donkey boiler, the recess is to be of a size sufficient to give space all round the boiler to admit of its being properly attended to. In order to afford protection against the heat from the boiler, the roof of the recess is to be not less than four feet clear of the top of the boiler, the space between the bunker or hold bulkhead plating and the chimney is to be not less than eighteen inches, and a baffle plate is to be fixed between the chimney and the bulkhead ; other efficient means may be provided. Wood lining is to be fitted on the hold side of the recess plating with an air space between it and the plating.

6. **Tie-beams across recess.**—When a recess extending above the hold beams is formed in the engine room bulkheads, the bulkhead is to be efficiently connected from side to side by a tie or bridle beam at about the height of the hold beams, strongly riveted to the plating and fitted with efficient gusset plates.

7. **Protection of deck under donkey boilers.**—Where vertical donkey boilers are placed on the decks of vessels, the deck underneath them is to be protected by being covered with firebrick or cement not less than two inches in thickness. The deck on which fires may be drawn from any donkey boiler is also to be protected by firebrick or cement not less than two inches in thickness.

8. **Shaft tunnel.**—The plating of shaft tunnels is to be of the thickness required in Table S 1 for the lower half of bulkhead plating : the top plating in way of the hatchways to be not less than $\frac{2}{20}$ of an inch thicker than the remaining plates, or to be covered with wood not less than two inches thick. The tunnel is to be strengthened with transverse angle bars of the size of the reversed frames spaced not more than two frame spaces apart, and 3 feet in way of the hatchways. The plating is to be caulked, and the tunnel tested with water from a hose to ensure its being water-tight. The bulkheads and top plating of tunnel recesses to be strengthened and supported by similar angles, but spaced the same as the vessel's frames : the top plating where attached to the sides of the vessel to be made water-tight with steel or iron collars or chocks, to the exclusion of wood or cement. The tunnel to be fitted with a water-tight sluice door on the engine-room bulkhead, capable of being closed from the upper deck.

COCKS, VALVES, AND SOIL PIPES. (See also Section 38.)

Section 27. 1. No sluice valve or cock is to be fitted to the collision bulkhead.

2. No sluice valves or cocks are to be fitted to the engine room, or other watertight bulkheads, unless they are arranged so as to be at all times accessible.

3. If the after peak is used as a ballast tank, no sluice valve or cock is to be fitted to the after bulkhead; but if it is not so used, and if no pump is fitted in it, a sluice valve or cock is to be fitted to the after bulkhead, to allow water to reach the pumps when required.

4. When sluice valves are fitted, they are to be so arranged as to be controlled above the Load Water Line. and the rods are to be boxed in to prevent injury.

5. All head and stern pumps if fitted are to be provided with sea-cocks fitted to the outside plating to the satisfaction of the Surveyors, and in places where they are at all times accessible.

6. Where soil pipes are attached to the outside plating below the load water-line, the lower length must be of steel or iron of substantial thickness, and be secured to the plating with a proper faced joint, and extended for some distance above the load water-line.

7. If the remainder of the pipe be of lead, care must be taken that it be of substantial thickness, and that it be properly protected externally with either zinc or iron, to the satisfaction of the Society's Surveyors.

HATCHWAYS. (See also Sketches, pages 159 & 160).

Section 28. 1. Beams at the ends of hatchways may be fitted with a large single angle bar, on the side of the beams clear of the hatchway, of equivalent sectional area to the double angles required by Table S 4A. Half beams are to be fitted to alternate frames in way of the hatchways where a wood deck is fitted and to every frame under a steel or iron deck, unless a wood flat is laid thereon, in which case half beams may be fitted to alternate frames.

2. The side coamings are to extend to the lower edges of the beams at the ends of the hatchways. The end coaming plates are to extend to the lower part of the beams at the ends of the hatchways and be riveted to them.

3. The thickness of coamings to be as follows :—

Length of hatchways.	Side coamings.	End coamings.
	Inches.	Inches.
Under 12 feet	$\frac{7}{20}$	$\frac{7}{20}$
12 feet and under 16 feet	$\frac{8}{20}$	$\frac{7}{20}$
16 feet to 24 feet	$\frac{9}{20}$	$\frac{8}{20}$

4. The minimum heights of hatchway coamings above weather decks to be as follows unless otherwise submitted and approved :—

On shelter decks, bridge decks, and awning or part awning decks ... 18 inches.
On upper decks, spar decks, and raised quarter decks ... ... 24 „
On upper decks in wells of well deck steamers ... ... 30 „

5. Shallow coamings to middle and lower deck hatchways will be sanctioned, provided the total depth of the fore and aft carlings and coamings be not less than 16 inches in hatchways of 10 feet and under 14 feet in length, 18 inches in hatchways of 14 feet and under 18 feet in length, and 20 inches in hatchways of from 18 feet to 24 feet in length ; but in all cases the coamings are to extend at least to the lower part of the beams at the ends of the hatchways. Middle and lower deck hatchway side coamings to be $\frac{1}{20}$ of an inch thicker than side coamings to upper deck hatchways of the same length.

6. Where square corners are adopted, the angles connecting the side and end coaming plates are not to be of less thickness than the side coaming plates.

7. The coaming plates are to be connected to the deck plating or tie plates with angles of not less thickness than the side coaming plates, welded at the corners of the hatchways. Where a wood deck is fitted, the vertical flanges of the angle bars connecting the side and end coamings to the deck are to extend half an inch above the deck.

8. All hatchway coamings on weather decks and the companions at the fore-end of steamers to be of steel or iron.

9. Where half beams are fitted to alternate frames, they are to be connected to the coaming plates with double angles. Half beams fitted to every frame may be connected to coaming plates with single angles of not less thickness than the side coamings. There are to be three rivets in each flange of the angles connecting coamings to the half beams where the depth of the half beam is $7\frac{1}{2}$ inches to $9\frac{1}{2}$ inches and four rivets where the depth is 10 inches to 12 inches.

10. Where there are no steel or iron decks, plates are to be fitted and riveted to the hatchway beams in order that the ends of the wood deck may be properly fastened, and side coaming plates are to be connected to deck plates of the thickness required for tie plates. The fore and aft tie plates in way of hatchways from 16 feet to 20 feet in length are to be double the width of those given in Table S 5 for a length extending two spaces of beams beyond each end of the hatchway.

11. Where the length of hatchway is 22 feet and above, the beams to upper deck (and deck above if fitted) are to be plated in way of same, and the plating is to be tapered before and abaft to stringer plate. Where steel or iron decks are fitted in accordance with the Rules, the thickness of the plating must be increased so as to efficiently maintain the strength of the deck in way of all hatchways and engine and boiler openings, and, in addition, doubling plates are to be fitted at the corners of all large deck openings, or the deck plating increased in thickness equivalent to the doubling plate.

12. Hatchways 12 feet and under 16 feet in length are to have shifting beams formed of bulb plate and double angles, or equivalent bulb tee. If the hatchways are less than 12 feet in width, the shifting beam is to be $8 \times \frac{8}{20}$, and if from 12 feet to 16 feet in width $9 \times \frac{9}{20}$. When the length of a hatchway is from 16 feet to 20 feet, a web plate beam is to be fitted at the middle of the length, extending in depth to the lower edges of the coamings. If the length is above 20 feet and not exceeding 24 feet, two web plate beams are to be fitted. Efficient means are to be provided for securing the shifting beams and web plates to the coamings. The web plate beams are to be stiffened at the upper and lower parts with double angles, and the thickness of the web plate is to be the same as that of the end coamings. Web plate beams in middle or lower deck hatchways are to be of not less thickness than the coamings to which they

are attached, and to extend to the lower edge of the coamings. Where shallow coamings are fitted, as described in paragraph 5 of this Section, the depth of the web plate at middle is to be not less than one and a quarter times the depth at ends, and the upper and lower parts of the web plate are to be stiffened with double angles.

13. Fore and afters are to be fitted in hatchways as follows:—

Breadth of hatchways.	No. of fore and afters.	Centre bulb plate.	Side bulb plate.
		Inches.	Inches.
6 feet and under 8 feet	1	$7 \times \frac{7}{20}$	...
8 „ „ 10 „	1	$8 \times \frac{8}{20}$	...
10 „ „ 12 „	3	$8 \times \frac{8}{20}$	$5 \times \frac{5}{20}$
12 „ „ 14 „	3	$9 \times \frac{9}{20}$	$6 \times \frac{6}{20}$
14 „ to 16 „	3	$10 \times \frac{10}{20}$	$7 \times \frac{7}{20}$

Double angles are to be fitted to the upper parts of the bulb plates. Wood fore and afters of equivalent strength may be adopted if iron plates be fitted to the ends. All fore and afters to be efficiently supported at the end coamings and web plate beams with castings or angles having a bearing of not less than two inches.

14. Plans of hatchways more than 24 feet in length or 16 feet in breadth, showing the scantlings and arrangements of deck plating, beams at ends of hatchways, coamings, web plate beams and fore and afters are to be submitted for approval, together with the additional transverse strengthening proposed in way of the same, either by means of web frames, increased depth of framing, or by double reverse frames.

15. The hatches of all vessels to be solid and not less than $2\frac{1}{2}$ inches to 3 inches in thickness. Efficient supports to be provided, having at least $1\frac{3}{4}$ inches bearing, for the ends of the hatches.

16. Cleats not more than 2 feet apart from centre to centre are to be fitted to the coamings for the purpose of efficiently securing the tarpauling covers. The cleats to be of strong section. Flat iron bars and suitable wedges or other efficient means to be provided for securing the tarpaulings.

17. In vessels having self-trimming hatchways, wing boards are to be fitted for preventing the shifting of cargo.

MASTHOLES.

Section 28a. 1. In way of mast wedging, where iron or steel decks are not fitted, plates are to be riveted to the beams of not less thickness than is required for stringer plates amidships, and of not less width than three times the diameter of the mast. In sailing vessels the mast ring is to be formed with bulb angle of the same thickness, and one inch deeper than the bulb angles required by Table S 1 for the frame of the vessel. In steamers the mast ring may be of plain angle of the size required for the frames.

ENGINE AND BOILER OPENINGS.

Section 29. 1. The engine and boiler openings of the weather deck of steam vessels are to be properly framed for a height of not less than 18 inches above the deck, the coaming plates to extend to the lower edge of the beams, and iron or steel trunk bulkheads connected to the coamings should be fitted to a height of about 7 feet above the deck; except in Awning and Partial Awning deck vessels where the height of the casing need not exceed 4 feet 6 inches above the deck, provided suitable iron covers be fitted, and the openings have coamings on the top of the casings not less than 9 inches in height; the thickness of the same, where exposed, to be not less than that required for the side plating of poops, and to be efficiently stiffened by vertical angles of the size of the reversed frames 30 inches apart, connected to the coaming plates. The thickness of the coamings to be $\frac{1}{16}$ of an inch more than required for the trunk bulkheads. Where the trunk bulkheads are enclosed by a complete bridge-house extending to the sides of the vessel, and efficiently protected from the force of the sea, a reduction from the above thickness might be admitted, provided in such cases a plan showing the proposed arrangement be furnished for approval. (*See* sketches on page 171.)

2. The engine and boiler openings in the 'tween decks of all vessels are also to be enclosed by trunk bulkheads efficiently stiffened by angle bars 30 inches apart, and extending to the weather deck beams, to which they are to be secured.

3. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least 18 inches above the deck, and efficient arrangements made for their security.

4. When a poop, or bridge-house, covers the engine and boiler space, the coamings of the engine and boiler openings should not be less than 2 feet above such deck, unless these openings are constructed as provided for in the first paragraph of this section.

5. It is considered that in all cases the engine and boiler openings should be made as small as practicable, and be subdivided by athwartship iron divisional casings to secure the maximum safety of the vessel. The two sides of the casing should in all instances be efficiently connected by angle beams within them at the upper part.

6. The engine-room skylights are to be in all cases substantially constructed and to be securely bolted or riveted to the coamings, and where the skylight top is not solid with bull's eyes fitted in the same, efficient deadlights of metal or wood must be provided. The grating openings over the stokehold must also be protected by plates, fitted with hinges, or otherwise in a manner satisfactory to the Surveyors.

7. Where either of the openings exceeds 15 feet, or the combined length exceeds 30 feet, the beams in way of the same are to be plated over from the stringer to the tie-plates, the plating extending two beam spaces beyond the openings, and tapered from thence towards the stringer plate for a distance not less than the breadth of the plating required to be fitted; the thickness of this plating to be the same as given in Table S 5 for steel decks.

8. Where large openings are adjacent to each other, the intervening space between the hatchways to be plated over.

Steam Trawlers:—9. In all steam trawlers the deck beams should be wholly plated over in way of the engine and boiler casings, and the casings should extend down to the underside of the deck beams, and be connected to the deck plating with angle bars and to the half beam ends with angle lugs. If the casings be not extended down to the underside of the beams, they should be attached to the deck plating with angles $4\frac{1}{2} \times 4\frac{1}{2} \times \frac{7}{20}$, having two rows of reeled rivets in each flange. In order to ensure that the scantlings and construction of these casings are satisfactory in every case, detailed plans of the same should be submitted for approval.

COAL BUNKER PIPES AND LIDS.

Section 30. Coal bunker pipes, where practicable, are to be formed so as to be at least twelve inches above the upper deck, fitted with lids having studs to fit in openings made in the pipes, for their security; the pipes to be so formed that tarpaulin may be securely lashed over them. Where there are coal bunker hatches in the weather deck they must be properly framed with coaming plates of suitable height having solid hatches secured by an iron bar or other approved fastening.

PORTS AND SCUPPERS.

Section 31. 1. All vessels must be fitted with a sufficient number of ports and scuppers, to readily discharge any large quantity of water from the upper deck. The ports and flaps, where such are adopted, are to be hung by strong hinges with yellow metal pins, and the scuppers formed in the vertical flange of the upper deck stringer angle bar, which is to be increased in depth so as to enclose the scuppers; or any other equally efficient plan may be adopted.

2. Where the bulwark plating and main rail are cut through to form a cargo port, the bulwark stays at each end of the port should be of increased strength, to the satisfaction of the Surveyors.

3. A sufficient number of scuppers, with proper pipes attached to them, are to be fitted in all 'tween decks to convey water or leakage to the bilges.

4. In Well deck vessels, the freeing port area in the "Well" should be in accordance with the following Table :—

Length of Bulwarks in "Well," in feet.	Freeing Port Area on each side, in square feet.
30	9·5
35	10·0
40	10·5
45	11·0
50	11·5
55	12·0
60	12·5

65 and above, one square foot to each 5-ft. length of bulwarks.

VENTILATORS.

Section 32. 1. It is recommended that ventilators, sufficient in number and size, be efficiently fitted to upper decks of all vessels.

2. The coamings of weather deck ventilators should not be less than 3 feet in height and of the following thicknesses :—

Under 12 inches in diameter	... ...	$\frac{1}{4}$ of an inch.
12 inches and under 15 inches	... ...	$\frac{5}{16}$ "
15 " " 24 "	... ...	$\frac{3}{8}$ "

Where a steel or iron deck is fitted, these coamings are to be connected to it with angles $\frac{1}{16}$ of an inch thicker than the coaming. Where there is no steel or iron deck fitted, plates are to be fitted under the wood deck to take the bolt fastenings.

3. Means are to be provided for efficiently covering the openings in the deck when the cowls are unshipped.

4. When scuttles are fitted for ventilation in the topsides of vessels, strong covers for them are to be provided ; these covers to be efficiently fitted, to the approval of the Surveyors.

5. Where scuttles are fitted in the sheerstrake within three-fifths of the vessel's length amidships, compensation is to be given either by an extra thickness in the sheerstrake, doubling plate in way of the scuttles, or else by the introduction of strong angle bars over them.

CHAIN PLATES.

Section 33. The chain plates to be in proportion to the size of the vessel, and riveted efficiently to the outside plating (not bulwark plating), the sheerstrake being preferable.

BITTS.

Section 34. All bitts, when not of steel or iron, and which do not go down to the deck below, to be fitted into proper sockets fastened through the deck to plates riveted to the beams.

CEMENT.

Section 35. 1. The frames and plating of the bottom of all vessels to the upper parts of the bilges to be thickly and efficiently covered with Portland or other approved cement, which may be mixed with sand or other suitable substance. Care to be taken to have a proper substance of cement at its termination, and to keep the watercourses clear all fore and aft. The whole to be to the satisfaction of the Surveyors.

2. Where asphalt, enamel cement, or similar compositions are to be used, the same must be sanctioned by the Owners, and samples are to be submitted for the approval of the Committee.

3. The condition of such compositions is to be ascertained by the Society's Surveyors biennially and vessels coated with compositions as above described will be distinguished with a record of "Asp." in the Register Book.

RUDDERS AND STEERING GEARS.

Section 36. 1. Rudders to be made to ship and unship while the vessel is afloat. The scantlings of a rudder to be regulated by the number which governs the thickness of the vessel's plating, except in a spar-deck vessel, where the number for rudder scantlings is to be taken as for a three-deck vessel of the same dimensions. The scantlings for rudders with side plates are given in Table S 3, and for single plate rudders in Table S 3 B. The diameters of rudder heads for steam vessels to be calculated by the following formula, but in no case is the diameter to be less than that given in Table S 3.

$$d = \frac{1}{32}\sqrt[3]{\mathrm{D} \times \mathrm{b}\,(2\,\mathrm{B} - \mathrm{b}) \times \mathrm{S}^2}$$

where d = diameter of rudder head in inches, D = feet draught, B = the greatest distance in inches from the centre of pintles to back of rudder, b = the greatest breadth of the rudder in inches and S = speed in knots.

2. Forged rudder frames are to be of the best hammered iron or steel. Suitable stops for the rudder should be securely fastened to the deck in way of the tiller or quadrant tiller, together with stops on the rudder and rudder post. Where a suitable brake is fitted to the tiller or quadrant tiller, or where the steering quadrant is geared direct on to the steam steering engine, the deck stops may be dispensed with. The stops of the steam steering engines should be fitted at a smaller angle of helm than the rudder stops, so as to prevent excessive strains consequent on a rudder being forced against its stops. The frame and main piece of side plate rudders must be forged in one piece and stayed at intervals corresponding with the pintles. The side plates to be of the thickness given in Table S 1 for the lower half of bulkheads, and, where practicable, should be in one length. The side plates to be countersunk and the rivets to have full heads and points. It is recommended that the pintles be made independent of the frame. The pintles should be spaced not more than 4 feet to 5 feet 6 inches, centre to centre, and the top pintle should be as near as practicable to the rudder trunk. Side plates should be secured to rudder frame with rivets of not less size than those required for the upper edge of the garboard strake amidships, and be spaced not more than five diameters from centre to centre.

3. Solid cast steel rudders of approved manufacture, and satisfactorily tested, will be admitted, if the particulars of such rudders, in the first instance, be submitted to and approved by the Committee.

4. **Single plate rudders** for steam vessels to have the scantlings and the spacing of the arms in accordance with Table S 3 B. The main piece to have a straight taper from below the top pintle where the sectional area is to be not less than that of the rudder head, to the heel where it is to be of the size required. The arms to be fitted alternately on opposite sides of the plate. A vertical groove in depth equal to the thickness of the plate, but not to exceed one inch, to be formed in the main piece to receive the fore edge of the plate, except in those cases where the arm fillets have a radius equal to half the distance between the arms, when the groove may be dispensed with. Fillets to arms forged or cast on the main piece not to have a less radius than one-fifth the distance between the arms. The rudder head may be secured to the lower part of the rudder by means of a keyed and bolted coupling provided the arrangements proposed be submitted to and approved by the Committee.

5. In a sailing vessel the diameter of the rudder head required by Table S 3 is to regulate the scantlings for a single plate rudder, and these scantlings are to be in accordance with Table S 3B requirements for rudder heads of the same diameter.

6. The depth of rudder gudgeons not to be less than seven-tenths of the diameter of the rudder head, and the thickness one-half the diameter of the pintles.

7. Vessels which have not two independent steering gears are to have spare tiller and gear ready for use when required.

8. Where combined hand and steam steering gear is adopted, and in which both gears depend upon the efficiency of a keyed quadrant or tiller, independent means of steering must be provided.

9. Steamers above 250 feet in length are to be fitted with steam steering gear in addition to hand steering gear, and it is recommended that the two controlling wheels for the same should be placed one at the gear and the other on the navigating bridge.

10. In steamers above 250 feet in length, not having full poops or shelter decks, the after steering wheel and gear are to be protected by a substantially constructed iron or steel deck-house or hood.

11. Springs or buffers are to be fitted to all steam steering gear of steamers.

12. The diameters of steering chains and rods are to be as given in Table S 3C for the various diameters of rudder heads and the corresponding radii of quadrant tillers. Where the radius of quadrant or length of tiller adopted differs from that given in the Table, the diameter of steering chain is to be calculated from the following formula :—

$$d = \cdot 38\sqrt{\frac{D^3}{R}}$$

where d = diameter of chain in inches ;

D = diameter of rudder head in inches according to Table for rudder heads.

R = radius of quadrant or length of tiller at the centre of the chain in inches.

13. The steering rods are to be one-fourth larger in diameter than the chain or of the corresponding diameter given in the Table for the chain required.

14. The sizes of the tillers or quadrant tiller arms are to be as given in Table S 3C, or of equivalent strength.

15. Care should be taken that the leads of the steering chains are made as direct as possible, sharp nips or bends being avoided.

16. The diameters at the centre of the chain of leading block sheaves are not to be less than sixteen times that of the steering chains, and the pins of the sheaves are not to be less than twice the diameter of the chains.

17. The tests of cast steel rudders, steering quadrant and tillers, to be as follows :—A tensile test is to be made on a piece taken from each casting, and the extension on a length of 8 inches is not to be less than 8 per cent., and the tensile strength not less than 28 tons, nor more than about 35 tons per square inch. A cold bending test also to be made corresponding to each tensile test, and the sample to be one inch square, and to bend cold before fracture through an angle of at least 90°.

18. Rudders, steering quadrant and tillers to be dropped on hard ground from a height of from 7 to 10 feet, according to the design, shape and weight of the casting. The casting in each case to be

subsequently slung up and well hammered with a sledge hammer, not less in weight than 7 lbs., to satisfy the Surveyors that the casting is sound and without flaw. Castings of complex design, which would be liable to be deformed if submitted to the drop test, may have this test dispensed with provided tensile and cold bend tests be made upon two pieces taken from positions as far apart as practicable on each casting. The castings in such cases to be slung up and well hammered as described above.

WINDLASS AND HAWSE-PIPES.

Section 37. 1. The windlass, for all grades, if of wood, may be composed of any of the following timbers; namely, English, African, or Live Oak; Adriatic, Italian, Spanish, Portuguese or French Oak; East India Teak, Morung Saul, Greenheart, Morra, or Iron Bark. The iron or steel spindle in all cases to pass through the body of the windlass.

2. The hawse-pipes must be of sufficient size and thickness, and the outside flange of proper form to admit of an easy lead for the cable to the windlass or capstan.

PUMPS.

Section 38. 1. In Steam Vessels the pumping arrangements according to the division of holds &c., to be as follows :—

2. **Holds with double bottoms.**—In the double bottom of each compartment of the hold and of engine and boiler space, a steam pump suction is to be fitted at the middle line, and one on each side to clear the tanks of water when the vessel has a heavy list. Where there is considerable rise of floor towards the ends of vessels, the middle line suction only will be required. A steam pump suction and a hand pump are also to be fitted to each bilge in each hold where there is no well. When there is a well, one or three steam pump suctions are to be fitted in the same according as there is considerable or little rise of floor, and hand pumps fitted at the bilges.

3. **Holds without double bottoms.**—Where there is considerable rise of floor, one steam pump suction and one hand pump are to be fitted in each hold. In vessels with little rise of floor, two or three steam pump suctions and at least one hand pump to be fitted to each hold.

4. **Engine and boiler space.**—Where a double bottom extends the whole length of engine and boiler space, two steam pump suctions are to be fitted to the bilge on each side. Where there is a well, one steam pump suction should be fitted in each bilge and one in the well. Where there is no double bottom in the machinery space, centre and wing steam pump suction should be fitted. The rose box of the bilge injection is to be fitted where easily accessible, and is to be used for bilge water only. The main and donkey pumps to draw from all compartments, and the donkey to have also a separate bilge suction in the engine room.

5. **Fore and After Peaks.**—If the Peaks are fitted as water ballast tanks, a separate steam pump suction is to be led to each. If not used for water ballast, an efficient pump is to be fitted in the fore peak. If the after peak is used as a ballast tank, no sluice valve or cock is to be fitted to the after bulkhead; but if it is not so used, and if no pump is fitted in it, a sluice valve or cock is to be fitted to the after bulkhead, to allow water to reach the pumps when required.

6. **Tunnel.**—The tunnel well is to be cleared by a steam pump suction.

7. **All Hand Pumps** to be capable of being worked from the upper or main decks above the deep load water line, the bottoms of the pump chambers are not to be more than 24 feet above the suction rose, and the pumps are to be tested by the Surveyors to ensure that water can be pumped from the limbers. The sizes of the hand pumps to be not less than those given in the following Table :—

Tonnage under Upper Deck.	Hand Pumps in Holds.	
	Diameter of Barrel.	Diameter of Tail Pipe.
	Inches.	Inches.
In vessels under 500 tons...	4	2
In vessels of 500 tons but under 1,000 tons	$4\frac{1}{2}$	$2\frac{1}{4}$
In vessels of 1,000 tons but under 2,000 tons	5	$2\frac{1}{2}$
In vessels of 2,000 tons and above	$5\frac{1}{2}$	$2\frac{3}{4}$

In lieu of hand pumps in each compartment an approved fly wheel pump may be fitted if it is connected to the steam pump bilge suction pipes of these compartments.

8. **No Sluice Valve or Cock** is to be fitted to the collision bulkhead.

9. **No Sluice Valves or Cocks** are to be fitted to the engine room, or other watertight bulkheads unless they are arranged so as to be at all times accessible.

10. **When Sluice Valves** are fitted, they are to be so arranged as to be controlled above the Load Water Line, and the rods are to be boxed in to prevent injury.

11. **Sounding Pipes** to be fitted on each side of holds and ballast tanks, and a doubling plate is to be fitted under each.

12. **Air Pipes** to be fitted to each ballast tank as required.

13. All **Cocks** and **Valves** in connection with bilge and ballast suction pipes are to be fitted in places where they are at all times accessible.

14. All **Bilge Suction Pipes** are to be fitted with strum boxes or strainers, so constructed that they can be cleared without breaking the joints of the suction pipes. The total area of the perforations in the strainers should be not less than double that of the cross section of the suction pipe.

15. The filling pipes for deep tanks which can be used for either cargo or ballast must be controlled by valves placed in an accessible position, and so arranged that when the tank is being used for cargo it will be impossible to fill it with water. This result is to be obtained by taking out a short bend or wedge piece and fitting blank flanges in its place, or in some other way to be submitted to and approved by the Committee.

16. The **Pipes** for bilge or ballast suctions are to be fitted with flanged joints in convenient lengths, so that they may be easily disconnected for clearing. In the case of cast iron suction pipes, which are not also used as tank filling pipes, or which cannot be subjected to sea pressure, spigot and faucet joints made with india-rubber rings fitted over the spigots might be adopted, except in the case of bilge suction pipes passing through ballast tanks, which should be fitted with flanged joints.

17. The **Suction Pipes** to fore and aft peaks, and to the tunnel well, should not be less than $2\frac{1}{4}$ inches inside diameter, except in vessels under 500 tons under deck, in which case they may be made 2 inches.

18. The **Bilge Injection** should not be less than two-thirds of the diameter of the sea inlet to the circulating pump.

19. The inside diameter of other bilge suction pipes should not be less than given in the following Table :—

TONNAGE UNDER UPPER DECK.	Engine Room Centre Suction, Separate Donkey Suction, and Hold Centre Suctions.	Wing Suctions in Holds where no Centre Suctions are fitted, and Wing Suctions in Engine Room.	Wing Suctions in Holds where Centre Suctions are also fitted.
	Inches.	Inches.	Inches.
In vessels under 500 tons	2	2	2
„ 500 tons but under 1000 tons ...	$2\frac{1}{4}$	2	2
„ 1000 „ „ 1500 „ ...	$2\frac{1}{2}$	$2\frac{1}{4}$	2
„ 1500 „ „ 2000 „ ...	3	$2\frac{3}{4}$	$2\frac{1}{4}$
„ 2000 „ „ 3000 „ ...	$3\frac{1}{2}$	3	$2\frac{1}{2}$
„ 3000 tons and above	$3\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{3}{4}$

In cases where more than one suction to any one compartment are connected to the pumps by a single pipe, this pipe should be not less than the size required for the centre suction.

EQUIPMENT.

Section 39. 1. All vessels having masts, spars, rigging and sails, shall be required to have them maintained in good order.

2. Every ship is to be provided with anchors, cables, &c., of approved quality, tested at a *public machine* recognised by the Committee, in number and length as set forth in Table No. 22. (*See* after page 171).

3. To entitle vessels classed A "For Channel Purposes" to the Figure 1, the equipment of Anchors and Chain Cables, &c., should be as required by Table 22, with the exception that not more than two bower anchors and one stream anchor need be supplied. The first bower anchor should be of the full weight required by the Table, and the second bower may be 15 per cent. lighter. This rule, however applies only to vessels intended for short passages.

4. In vessels classed "For Channel Purposes" which are intended for longer voyages, such as the Queenboro'–Flushing, the Channel Islands, or the Irish Sea service, the equipment must be in accordance with the requirements of Table 22.

5. In the cases of *foreign owned vessels* classed with the Figure 1, in which the chains and anchors, or part of the same, have been tested under the inspection of the Society's Surveyors at Proving Establishments out of the United Kingdom recognised by the Committee, and test certificates of the same are furnished, duly signed, by the Society's Surveyors and the Secretary, the vessel will have recorded in the Register Book the notation A.&C.P., A.P. or C.P. as the case may be. Where, however, the anchors or cable for *foreign owned vessels* are manufactured abroad, and test certificates are furnished setting forth that they have been tested at a Government machine, or at a machine under the control of a municipal body or a similar responsible body, but not under the inspection of a Surveyor to the Society, the record of A.&C.P., &c. will not be made in the Register Book, though such certificates will be accepted, as complying with the requirements of the Rules, for assigning the Figure 1, provided the remaining requirements of Table 22 be complied with.

6. A certificate of all chains and anchors having been tested, and of the strain applied to them, must be produced before the ship is classed with the Figure 1.

7. The equipment as regards anchors, chains, warps, &c., is to be regulated by the number produced by the sum of the measurements in feet of the half moulded breadth of the vessel at the middle of the length, the depth from the upper part of keel to the top of upper deck beams, with the normal round up, and the girth of the half-midship frame section of the vessel, measured from the centre line at top of keel to upper deck stringer plate, multiplied by the length of the vessel for a one, two, and three decked vessel, and for a spar decked vessel. In awning decked and part awning decked vessels the measurements of depth and girth defined above are to be taken to the main deck; in shelter decked vessels to the deck next below the shelter deck; and in turret deck vessels to the normal beam line at base of turret.

8. For a steam vessel having erections on deck, the number obtained by the previous paragraph is to be increased as follows :—

For a raised quarter deck, add twice the product of the height and length in feet of the erection.

For an awning deck, part awning deck, shelter deck, poop, bridge-house, or forecastle, add one and a half times the product of the height and length in feet of the erection.

For deck houses, or other erections (except engine and boiler casings) not extending to the side but exceeding either in length or breadth half the rule breadth of the vessel, add the product of the height and length in feet of such erections.

Where erections are fitted upon erections, the equipment number is to be correspondingly increased.

9. For a sailing vessel with a poop, bridge-house, top-gallant forecastle, or a raised quarter deck, the equipment number is to be increased one-fifteenth beyond that which it would be if she were flush decked.

10. The equipment for Sailing and Steam Trawlers and Tugs is to be as given on back of Table 22.

11. All vessels under 150 tons to be provided with one good boat; and every vessel of 150 tons, and above, to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels.

12. **Anchor Cranes** and **Boats' Davits** to be in accordance with Table 12.

13. The efficient state and condition of the whole of a vessel's equipment will be designated by the Figure 1 placed after the character assigned to the vessel; and in cases in which the equipment is found

insufficient in quantity or defective in quality, a dash thus –, will be inserted in place of the Figure 1. In cases where the Figure 1 is expunged on account of deficiencies in the anchors or chains, the record of Lloyd's A.&C.P. or A.&C.P. will also be expunged.

REPORTS ON VESSELS.

Section 40. 1. The Surveyors, in submitting their Reports of vessels not already classed, are in all cases, where practicable, to forward a sketch of the midship section, and other drawings where necessary, to be furnished by the builders, with figured dimensions of the component parts marked thereon.

2. Builders wishing to adopt plans other than those described herein, are to submit them through the Resident Surveyors (who are to state their opinions thereon) for the Committee's consideration and approval.

"THREE-DECK" STEAM VESSELS.

Section 41. 1. Steam vessels not less than 17 feet depth from top of keel to the middle deck, having two or more complete decks laid and caulked, and a tier of hold beams, or extra strong beams, or web-frames and stringers or deep framing and stringers in lieu thereof, will have their scantlings determined as follows:—Such vessels to be denoted in the Register Book, "3Dks," or "2Dks3trB.," "2Dks &web frames," or "2Dks&deep framing," as the case may be.

2. The scantlings and spacing of the frames, reversed frames and floor-plates, the thickness of bulk-heads, and diameter of pillars, are determined by the number produced by the deduction of *seven feet* from the sum of the measurements in feet arising from the addition of the half-moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the *upper deck beams*, with the normal round-up, at the middle of the vessel's length, and the girth of the half-midship frame section of the vessel, measured from the centre line at the top of the keel to the upper deck stringer plate.

3. The scantlings of the keel, stem, sternpost; the thickness of the outside plating, keelson and stringer plates, and deck; also the scantlings of the angle bars on beam stringer plates, and keelson and stringer angles in hold, as in Tables S 2, S 3, and S 5, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

4. All the frames are to extend to the upper deck stringer plate.

5. The reversed frames are to extend to the upper part of the middle deck beam stringer angle, and to the upper part of the frames alternately.

6. The plating to be of the thickness given in Table S 2, from the keel to the gunwale; the sheer-strake to be placed at the gunwale, and the strake of plating in way of the middle deck to be an outside strake.

7. The upper and middle deck stringer plates to be of the breadth and thickness prescribed in Table S 5. The middle deck stringer plate to be fitted and connected to the outside plating by angles between the frames of the size given for beam stringer angles; and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angles on each frame, and to the stringer plate, the space between this angle bar and the outside plating, all fore and aft, to be filled in and made water-tight. Similar angle bars are to be riveted to the stringer plate, reversed frames, and outside plating at the lower deck stringer.

8. The butt-straps of the sheerstrake and upper and middle deck stringer plates, and of not less than three strakes of plating at the bilge to be treble riveted, for not less than half the vessel's length amidships, and otherwise as per Section 20.

9. In these vessels a side intercostal keelson is to be fitted and attached to the outside plating by angle bars of not less size than $3 \times 3 \times \frac{8}{20}$; but if the plating number is 21,700 and under 30,400, these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$; if of this number and above, they are to be not less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

10. The thickness of the flat of upper deck is to be as given in Table S 3. In all cases a middle deck is to be properly laid and caulked, the thickness of which may be one half inch less than that prescribed for the upper deck.

11. Engine-room hatchways on the middle deck are to be enclosed by steel or iron trunk bulkheads, efficiently strengthened, and extended from the middle deck to the upper deck, as prescribed in Sec. 29.

12. If in such vessels the length exceeds *eleven* times the depth taken from the *upper part of the keel* to the top of the *middle deck beams*, additional strength will be required at the bilge and bottom, as per Table S 6; but no additional strength at the sheerstrake and stringer plate will be needed until the length exceeds *eleven* times the depth taken from *the upper part of the keel* to the top of the *upper deck beams*; when this is the case, additional strength will be required in the *upper deck* sheerstrakes and stringers, as per Table S 6 relating to vessels' proportions.

13. In steam vessels requiring by Table S 5 to have not more than one steel deck and in which the scantlings, etc., are not less than those required by the foregoing Rules for three-deck vessels, the wood middle deck may be dispensed with, provided the frames and reverse frames only are of the size required by the number produced by the measurements taken to the upper deck without the deduction of 7 feet and all the reverse frames are extended to the upper deck. Other suitable compensation in lieu thereof may be submitted for the Committee's approval.

Such vessels will be recorded in the Register Book as 1 Dk. (Stl.) 2 tr. B. & web frames or deep framing, 3 deck rule.

SPAR-DECKED STEAM VESSELS.

Section 42. 1. Vessels noted in the Register Book as "Spar-deck" are those which are of lighter construction* than vessels built under the "Three deck" rule having the same dimensions, taken with reference to the total depth of the spar or upper deck in either case.

2. They must have three tiers of beams and be not less than 17 feet depth from top of keel to the main deck. The Committee, however, will approve of the construction of Spar-deck vessels having a somewhat less depth of hold provided the plans be in the first instance submitted for approval. For such vessels having less than 17 feet depth from top of keel to the main deck, a minimum freeboard must also be submitted to the Committee for approval, and the freeboard sanctioned is to be inserted in the Certificate and in the Register Book, and marked on the ship's sides.

3. In cases where erections are required on the spar deck, plans must be submitted showing the additional strengthening proposed, which must be to the satisfaction of the Committee.

* This does not necessarily imply that the vessel is of less strength in relation to the amount of dead-weight carried at a suitable load-line.

4. In such vessels the scantlings and arrangements are to be regulated by the dimensions under the main deck, as in those having one or two decks.*

5. *All* the frames must extend to the spar-deck stringer plate.

6. The reversed angle bars on the frames are to extend to the upper part of the main deck beam stringer angle, and to the upper part of the frames, alternately.

7. The main and spar deck sheerstrakes, and the plating between them, to be in thickness as prescribed in Table S 2. The riveting of the butts of the plating between these sheerstrakes to be regulated by Section 19, paragraph 11, and Section 20.

8. A reduction of $\frac{1}{20}$ of an inch from the thickness required by the upper line of Table S 5 for stringer and tie-plates will be allowed for those of the spar deck.

9. The butt-straps of the spar and main deck sheerstrakes and stringer plates, and of not less than three strakes of plating at the bilges, to be treble riveted for at least half the vessel's length amidships, and otherwise as per Section 20.

10. In these vessels a side intercostal keelson is to be fitted and attached to the outside plating by angle bars of not less than $3 \times 3 \times \frac{8}{20}$; but if the plating number is 21,700 and under 30,400 these angle bars to be $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$; if of this number and above, they are to be not less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

11. The lower edge of the main sheerstrake must not be more than one-half its depth below the main-deck stringer plate.

12. The main-deck stringer plate is to be fitted and connected to the sheerstrake by angle bars between the frames, of the size given for beam stringer angle bars, and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be riveted to reversed angle bars on each frame, and to the stringer plate; the space between this angle bar and the sheerstrake, all fore and aft, to be filled in and made water-tight. Similar angle bars are to be riveted to the stringer plate, reversed frames, and outside plating at the lower deck.

13. These vessels are to have a complete main deck $3\frac{1}{2}$ inches in thickness, laid and caulked.

14. The flat of spar deck to be not less than $3\frac{1}{2}$ inches in thickness.

15. Engine-room hatchways on the main deck are to be enclosed by steel or iron trunk bulkheads efficiently strengthened and extended from the main deck to the spar deck. (*See* Section 29.)

16. The diameters of rudder head and pintles to be regulated by the number which regulates the plating of a three deck vessel of the same dimensions. (*See also* Section 36.)

17. The measurement of depth, for regulating the additional strength required for vessels of extreme proportions, is to be taken from the upper part of keel to the top of the *main deck beams*.

18. When Table S 6 applies to these vessels, the increased strength defined for sheerstrakes is to be added to those of either the spar or main deck.

19. They are to have extra strength at the bilge and bottom in the proportion of their length to depth from main deck as prescribed in Table S 6; they may, however, be 13 and under 14 depths in

*Where the height between the main and spar-deck stringers at the sides is 8 feet or above at any part, additional transverse strength will be required to the satisfaction of the Committee.

length before they are required to have the remaining extra strength prescribed for vessels of 11 to 12 depths in length, and such vessels exceeding the above proportions to have extra strength in the same relation to that prescribed for one and two-decked vessels. In no case will the material at the upper part and the number and thickness of steel or iron decks be required to be greater than that of the three-deck vessel of the same dimensions.

20. Vessels to which this rule applies will be noted in the Register Book thus :—" *Spar dk.*"

21. In spar decked steam vessels, requiring by Table S 5 to have not more than one steel deck, the wood main deck may be dispensed with, provided the whole of the reversed frames be extended to the spar deck and the frames and reversed frames be regulated by the measurements taken to the spar deck with a deduction of 7 feet, and where deep framing is fitted it is to be in accordance with the increased number and as required by the column headed " Spar Deck Vessels " in Table S 1.

22. Such vessels will be classed in the Register Book *with freeboard* and the freeboard assigned will be inserted in the certificate of classification, and recorded in the Register Book. The record of decks, &c., will be " Spar Deck (Stl)," " 2 trs. B " and " Web Frames " or " Deep Framing.".

AWNING DECKED AND PART AWNING DECKED STEAM VESSELS.

Section 43. 1. **Method of obtaining Scantlings.**—In an awning decked vessel the scantlings and arrangements are to be regulated by the dimensions under the main deck as in a one or two-deck vessel, exclusive of the awning deck.

2. **Freeboard a condition of Class.**—It is a condition on which an awning or part awning decked vessel is classed in the Society's Register Book that the freeboard assigned shall be marked on the vessel's sides as hereafter described.* If the vessel proceed to sea with a less freeboard than that approved by the Committee, or if the freeboard mark be placed higher than the position assigned by the Committee, the vessel will be liable to have her class expunged from the Register Book.

3. **Submission of Plans and Freeboard.**—The plans of such vessels and a minimum freeboard must be submitted to the Committee for approval, and the freeboard thus sanctioned is to be inserted in the Certificate and in the Register Book, and marked on the vessel's sides.*

4. **Forfeiture of Class.**—In all such cases, if the vessel has for any reason forfeited her class, the freeboard assigned as a condition of classification, will be omitted in reprinting the Register Book, unless the class be previously re-instated.

5. **Notation in Register Book.**—Vessels to which this Section applies as regards an entire awning deck will be noted in the Register Book thus :—" Awng. dk." Those having a part awning deck will be noted " pt. Awng. dk."

6. **Deck Erections on Awning Deck.**—When it is intended to fit erections on an awning deck, plans are to be submitted for the consideration of the Committee, showing the additional strengthening proposed to be fitted.

7. **Scantlings and Riveting.**—The scantlings of the awning deck side plating and stringer plates are to be as required by Table S 2A. The awning deck sheerstrake and side plating may be reduced at the ends to the thickness given in the Tables for the side plating of poops and forecastles, and the awning

* See Notes of Freeboard requirements printed at end of Rules.

deck stringer plates at ends of vessel to the dimensions required for poop and forecastle stringer plates. An iron or steel deck to be fitted on the awning deck beams as may be required by Table S 2A. The attachments and riveting of the butts, edges, &c., of the awning deck stringer and plating, sheerstrake and side plating are to be as required by Sections 20 and 21 at an upper deck. The awning deck stringer angles are to be of the size given in Table S 3 for upper deck stringer angles.

8. **Framing.**—All the frames are to extend to the awning deck stringer plate, they are to be of the size given in Table S 1, but in no case less than $3\frac{1}{2}'' \times 3'' \times \frac{6}{20}''$. The whole of the reversed frames are to extend to the main deck stringer plate.

9. **Beams and Pillars.**—The beams are to be of the sizes given in Table S 4, and placed at every alternate frame. Where an iron or steel awning or part-awning deck is fitted, the beams are to be placed at every frame unless the iron or steel deck is sheathed with wood, in which case the beams may be placed at alternate frames. For diameter of pillars, *see* Tables S 1A, S 1B, and S 1C.

10. **Bulkheads and Casings.**—The collision bulkhead is in all cases to extend to the awning or part-awning deck, the remaining bulkheads may stop at the main deck, but a deep web frame or partial bulkhead is to be fitted on each side in the 'tween decks in continuation of each watertight bulkhead fitted below. Engine and boiler room hatchways on the main deck are to be enclosed by steel or iron trunk bulkheads efficiently strengthened, and extended from the main deck to the awning or part-awning deck (*see* Section 29).

11. **Main Deck.**—Awning decked and part-awning decked vessels are to have a main deck laid and caulked. Coamings and hatches are to be fitted as to a weather deck, but the height of the coamings may be as required at middle and lower decks (*see* Section 28).

12. **Main Deck Stringer.**—The main deck stringer plate is to be fitted and connected to the sheerstrake by angle bars between the frames of the size given for lower deck stringer angles, and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft must be fitted inside the frames. The space between this angle bar and the sheerstrake all fore and aft, to be filled in and made watertight.

13. **Deck Sheathing.**—Where a wood sheathing is laid upon an iron or steel awning deck the thickness should not be less than 3 inches if of pine, and $2\frac{1}{2}$ inches if of teak, and it should be efficiently secured between the beams to the deck plating. Iron or steel decks are not to be reduced in thickness from that given in Table S 2A when sheathed with wood.

POOPS, BRIDGES, AND FORECASTLES.

Section 44.—1. **Short Deck Erections.**—In poops and forecastles, also in bridges not exceeding one-fifth length of vessel, the side plating and deck stringer and tie plates are to be of the scantlings required by Table S 2A, the deck stringer angles are to be of the size given in Table S 3 for lower deck stringer angles, and the flat of wood deck may be one-fourth less than required by Table S 3. The butts of the side plating, stringers, and tie plates are to be double riveted; the seams of the side plating may be single riveted except at the ends of the bridge, where they are to be double riveted for a length of about 20 feet. Where the side plating is $\frac{9}{20}$ inch or above in thickness, the seams are to be double riveted throughout.

2. **Long Deck Erections.**—Where the combined length of the poop or raised quarter deck and bridge or forecastle and bridge exceeds two-fifths the vessel's length, also where a bridge is fitted of a length exceeding one-fifth the vessel's length, the scantlings of the bridge side plating and stringer plates are to be as required by Table S 2A. An iron or steel deck to be fitted on the bridge deck beams as may be required by Table S 2A. The attachments and riveting of the butts, edges, &c., of the bridge deck stringer and plating, sheerstrake and side plating are to be as required by Sections 20 and 21 at an upper deck. Where the seams of the side plating may not be required to be double riveted throughout, they must be double riveted for a length of about 20 feet at the ends of the bridge. The bridge deck stringer angles are to be of the size given in Table S 3 for upper deck stringer angles.

3. **Framing.**—All frames are to extend to the poop, bridge, or forecastle stringer plate. Partial bulkheads are to be fitted in bridges in way of large deck houses, also in continuation of watertight bulkheads fitted below, and at such other places as may be considered necessary by the Surveyor. Where it is intended to fit a poop, bridge or forecastle on a spar, awning or shelter deck, plans showing the additional strengthening proposed are to be submitted for the consideration of the Committee.

4. **Reversed Frames in Forecastles.**—In top-gallant forecastles of vessels whose plating number is 18,000 and above, the alternate reversed frames are to extend to the forecastle deck, or other efficient means of strengthening the forecastle may be adopted if approved by the Committee.

5. **Beams and Pillars.**—The poop, bridge and forecastle beams are to be of the sizes given in Table S 4, and placed at every alternate frame. Where an iron or steel bridge deck is fitted, the beams are to be placed at every frame unless the iron or steel deck is sheathed with wood, in which case the beams may be placed at alternate frames. For diameter of pillars, *see* Tables S 1A, S 1B, and S 1C.

6. **Upper Deck Stringer Plate.**—The upper deck stringer plate in way of the deck erections is to be fitted and connected to the sheerstrake by angle bars between the frames of the size given for lower deck stringer angles, and in addition an inner stringer angle bar of the same size passing continuously fore and aft must be fitted inside the frames. The space between this angle bar and the sheerstrake to be filled in and made watertight.

7. **Strengthening at ends of Bridges and long Poops.**—The main sheerstrake is to be doubled its full breadth with plates not less than 20 feet in length and the stringer plate doubled or increased in thickness at the ends of a bridge. This additional strengthening is also required at the fore end of a poop or after end of a forecastle which exceeds one-fourth of the vessel's length. The bulwark plating at these parts is to be increased in thickness and supported by bracket plates, and the freeing ports should have rounded corners and a substantial rim.

8. **Superstructures.**—Where it is intended to fit erections on a spar, awning or shelter deck vessel, the scantlings of the various parts of the erections are to be as required for a "three-deck" vessel of the same dimensions; and where a superstructure intended for passenger accommodation is to be built upon another superstructure, the deck beams above such accommodation are to be plated over in way of the same.

9. **Vessels of Extreme Proportions.**—Where the rule length of the vessel exceeds eleven times the rule depth, and the bridge does not extend over the midship half length of the vessel, the additions for proportions required to the topsides by Table S 6, are to be fitted from within the ends of the bridge to

a quarter the vessel's length from each end. All vessels having a length of thirteen depths and above to the upper deck are to have a bridge extending over the midship half length of the vessel.

10. **Poop and Bridge Bulkheads.**—Bulkheads at the fore end of all bridges and poops are to be of the thickness required for the side plating of short bridges, with coaming plates $\frac{1}{20}$ of an inch thicker than the bulkheads, those erections extending over the engine and boiler, or other deck openings, are to have the bulkheads stiffened with bulb angles one inch deeper than required by Table S 1, for bulb angle frames, spaced 30 inches apart, and connected both to the coaming plates and to the deck plating, or to an athwartship plate on the beams both below and above, with a bracket plate to each end of the bulb stiffener. Bulkheads at the fore end of poops not extending over engine and boiler, or other deck openings, to be stiffened with angle bars the size of the frames spaced 30 inches apart. The bulkheads at the ends of all poops, bridges and forecastles are to be placed over a deck beam.

11. **Deck Erections on Small Vessels.**—Where it is proposed to fit a poop, bridge or top-gallant forecastle to a vessel whose rule depth is less than $15\frac{1}{2}$ feet, plans showing the proposed additional transverse strengthening are to be submitted for the consideration of the Committee.

RAISED QUARTER-DECKS AND SUNK FORECASTLES. (*See Sketches on page* 161.)

Section 45. 1. Side plating of raised quarter-decks and sunk forecastles may be $\frac{1}{20}$ of an inch less in thickness than topside plating below it if the topside plating be $\frac{7}{20}$ of an inch in thickness or more.

2. The frames in all cases, and the reversed angles on alternate frames, are to extend to the raised quarter-deck and forecastle stringer plate.

3. The upper deck sheerstrake is to extend to the stern. The front or break bulkhead of the raised quarter-deck is to be stiffened by an athwartship plate, of not less size than the upper deck beam tie-plates, and efficiently connected to it by angle bars; this athwartship plate is to receive the deck ends, and is to be supported by bracket plates when not riveted to a beam.

4. The number and arrangement of hold beams, beam stringers, and stringers in hold, in way of raised quarter-decks, must be in accordance with the Rules for the increased depth of the vessel, and the height of the reversed angles on the frames is to be regulated by the number for scantlings which the increased depth would give. The main sheerstrake to be doubled for a reasonable distance before and abaft the break. Where, however, the raised quarter-deck is connected to a bridge-house, it is preferred that in lieu of this, the raised quarter-deck side plating should be doubled at the break for the same length. Should the raised quarter-deck side plating not be doubled, it must be increased in thickness at the break, in addition to the sheerstrake being doubled. The bulwark plate of the raised quarter-deck adjoining the bridge side plating to be increased in thickness, and the sheerstrake doubled at front of bridge. The butts of the side plating and stringers at these parts to be carefully arranged, and the butts of the raised quarter-deck side plating, main sheerstrake, and the strake of plating next below, are to be treble riveted in the neighbourhood of the break, and the butt-straps increased in thickness. The main deck stringer plate is to extend abaft the break about seven frame spaces and the raised quarter-deck stringer plate about four frame spaces before the break and the stringer plates below the main deck are to have a shift of

about 16 feet overlap ; the bridge stringer also is to extend abaft the break. *The size of beams of raised quarter-decks to be regulated as prescribed in Table S 4 and S 4A.*

5. In such vessels, of extreme proportions requiring by Table S 5 a steel deck, or part steel deck, where the raised quarter-deck is of considerable length, the main deck plating is to scarph the raised quarter-deck for a length of two to three frame spaces according to the size and proportions of the vessel. There are to be from four to five diaphragm plates of the thickness of the main deck plating, connecting the two decks, and attached to the bulkhead and decks by double angles and stiffened by an angle on the after edges. The raised quarter-deck side plating is to be doubled at this part for a length of 18 to 20 feet.

6. Web plates not less than 15 inches deep to be fitted on the fore side of the bulkhead in way of the diaphragm plates, efficiently bracketed to the main and bridge deck plating.

7. Where the plating number is 24,000 and under 26,000, the main and raised quarter decks are to be scarphed four frame spaces, and where the plating number is 26,000 and above, five frame spaces. The webs on the fore side of the break bulkhead are to be not less than 18 inches deep. In such vessels the raised quarter-deck side plating is to be doubled, commencing at one-fourth the length of the vessel from the stern and extending to 8 feet beyond the break of the raised quarter-deck.

8. The break bulkhead to be of the thickness of the bridge side plating, and stiffened with angles of the size of the frames spaced 30 inches apart.

9. Where the plating number exceeds 20,000, or the vessel is over 13 depths to length, the break bulkhead is to be not less than four frame spaces abaft the after end of the engine room opening.

10. Vessels which from their size and proportions do not require the decks to be scarphed, are to have from four to five bracket knees fitted on each side of the break bulkhead, the thickness of which is not to be less than that of the main deck plating.

11. The raised quarter-deck plating should be attached to the break bulkhead by double angles of not less size than that given in Table S 3 for middle deck stringer angles.

12. Where the combined length of the poop or raised quarter-deck and bridge or forecastle and bridge exceeds two-fifths the vessel's length, the scantlings of the bridge side plating and stringer plates are to be as required by Table S 2A.

VESSELS OF EXTREME PROPORTIONS.

Section 46. 1. Additional longitudinal strength, beyond that stated in the foregoing rules, and in Tables S 2, S 3, and S 5, will be required for vessels of extreme proportions, as shown in Table S 6.

2. *The length, breadth, and depth to be taken as per Section 1.*

3. For all vessels exceeding in length sixteen depths to the middle deck*, plans must be submitted for the approval of the Committee for giving the vessels sufficient additional strength longitudinally; and all vessels having a length of thirteen depths and above to the upper deck, are to have a bridge extending over the midship half length of the vessel.

*All vessels, excepting those with an awning deck, whose plating number exceeds 35,000 and exceeding 16 depths in length, taken from the main deck, are to have the whole of the reversed frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee. In the case of awning-decked vessels they are all to extend to the main deck.

4. In all cases where keelsons, or other additions, are required for a certain portion of the length of a vessel, care should be taken to avoid any abrupt termination of this additional strength by tapering the keelsons, &c., beyond these limits, and properly shifting their terminations.

VESSELS NOT BUILT UNDER SURVEY.

Section 47. 1. In cases of vessels not surveyed while building, for which a character may be required, application must be made to the Committee in writing, and such drawings, with scantlings of the vessel marked thereon, as may be obtainable, should be furnished, also particulars of the testing of the steel used in the construction of the vessel. The Committee will then direct a special examination to be made by two Surveyors of the Society (one of whom shall be an exclusive officer), for which purpose the vessel is to be placed on high blocks in a dry dock or on ways ; the hold to be cleared and proper stages made ; the rivets and plating of keel, and flat of bottom, thoroughly examined ; the close ceiling in the hold to be removed where deemed necessary, but in no case less than required for Special Survey No. 2. The coal bunkers of steam vessels to be cleared ; the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets, and inner surface of the plating exposed to view ;* all oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, stern-post, and rudder.

2. When the vessel is so prepared, the Surveyors are to ascertain the scantlings of the various parts, and verify the particulars given on the drawings furnished, drilling the shell plating where deemed necessary for this purpose. A few rivets are to be removed from various parts to ascertain their quality and the character of the countersinking and workmanship. A full report is to be made on a first entry report form for the information of the Committee, who will then assign the vessel such character as the facts may appear to them to warrant.

3. In addition to the above, if the age of the vessel be ten years or upwards, the requirements of the Special Survey No. 3 are to be complied with. The periodical surveys are subsequently to be held as in the case of vessels built under survey.

4. In steam vessels the Engines and Boilers are to be opened out for Survey, at least to the extent required for the Special Surveys Nos. 1, 2, and 3. The Screw Shaft is to be drawn and examined. The arrangements of sea cocks, bilge suctions, valves, etc., are to be made to conform to the requirements of the Rules, and the working pressure of the boilers is to be determined from their actual scantlings in accordance with the Rules for the construction of boilers, and particulars should be furnished respecting the testing of the steel.

RULES FOR THE BURNING AND CARRYING OF LIQUID FUEL.

Section 48. 1. In vessels fitted for burning liquid fuel, the record "Fitted for liquid fuel" will be made in the Register Book.

2. The compartments for carrying oil fuel must be strengthened to efficiently withstand the pressure of the oil when only partly filled and in a seaway. They must be tested by a head of water extending

* In cases where the inner surface of the bottom plating is coated with cement or asphalte, if the coating be carefully inspected, and tested by beating or chipping and found sound and adhering satisfactorily to the steel, its removal may be dispensed with, provided that upon the removal of a portion, the plating, frames, and rivets under it be found in satisfactory condition.

to the highest point of the filling pipes, or 12 feet above the load line, or 12 feet above the highest point of the compartment, whichever of these is the greater.

3. If peak tanks or other deep tanks are used for carrying liquid fuel the riveting of these should be as required in the case of vessels carrying petroleum in bulk. The strengthening of these compartments must be to the Committee's satisfaction.

4. Each compartment must be fitted with an air pipe to be always open discharging above the upper deck.

5. Efficient means must be provided by wells and sparring or lining to prevent any leakage from any of the oil compartments from coming into contact with cargo or into the ordinary engine room bilges.

6. If double bottoms under holds are used for carrying liquid fuel, the ceiling must be laid on transverse battens, leaving at least two inches air space between the ceiling and tank top and permitting free drainage from the tank top into the limbers.

7. The pumping arrangements of the oil fuel compartments and their wells must be absolutely distinct from those of other parts of the vessel and must be submitted for approval.

If it is intended to sometimes carry oil and sometimes water ballast in the various compartments of the double bottom, the valves controlling the connections between these compartments and the ballast donkey pump, and also those controlling the suctions of the special oil pump, must be so arranged that the suctions for each separate compartment cannot be connected at the same time to both pumps.

8. No wood fittings or bearers are to be fitted in the stokehold spaces.

9. Where oil fuel compartments are at the sides of, or above, or below the boilers, special insulation is to be fitted where necessary to protect them from the heat from the boilers, their smoke boxes, casings, &c.

10. If the fuel is sprayed by steam, means are to be provided to make up for the fresh water used for this purpose.

11. If the oil fuel is heated by a steam coil the condensed water should not be taken directly to the condenser but should be led into a tank or an open funnel mouth, and thence led to the hotwell or feed tank.

12. The above arrangements are applicable only to the case of oil fuel the flash point of which as determined by Abel's close test does not fall below 150° Fahrenheit.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.

26th April, 1906.

RULES

FOR THE

SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

1. In steam vessels, the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them in the manner shown in form No. 8. If found satisfactory, the Committee will thereupon grant a certificate, and insert in the Register Book the notification, "LMC" *in red* (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

2. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

3. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus : "✠LMC," or "✠NE & B," or "✠NB."

4. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined and from them the working pressure fixed.

5. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam ; any defects, &c., to be pointed out as early as possible.

6. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

7. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* paragraph 41.)

8. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

9. The boilers, together with the machinery, to be inspected at different stages of construction.

All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

No steel stays are to be welded.

Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

10. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

11. Two safety valves to be fitted to each boiler, and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60 lbs. per square inch, the safety valves may be loaded to 5 lbs. above the working pressure. If common valves are used their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used, they are to be tested under steam in the presence of the Surveyor; the accumulation in no case to exceed 10 per cent. of the working pressure.

12. An approved safety valve also to be fitted to the super-heater.

13. In winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

14. Each valve to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles to extend through the covers and be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

15. Stop-valves to be fitted so that each boiler can be worked separately.

16. Each boiler to be fitted with a separate steam gauge, to accurately indicate the pressure.

17. Each boiler to be fitted with a blow-off cock independent of that on the vessel's outside plating.

18. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyor.

QUALITY AND TESTING OF BOILER STEEL.

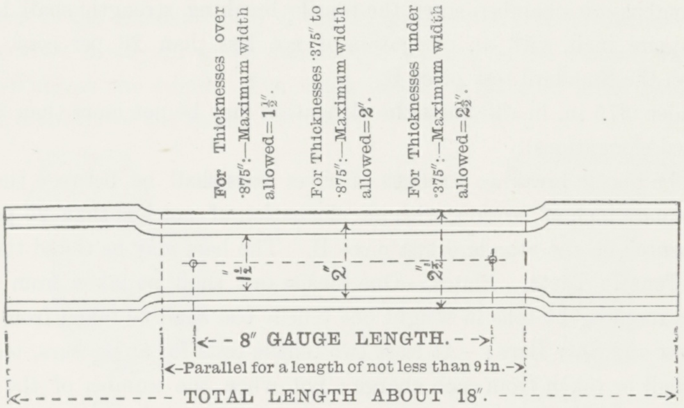
19. When steel is used in the construction of boilers intended for vessels classed or proposed for classification in the Society's Register Book, the boilers shall be constructed in accordance with the requirements of the Rules, and the following conditions be fulfilled :—

1. **Process of Manufacture.**—Steel for Marine Boilers shall be made by the Open Hearth process acid or basic.
2. **Freedom from Defects.**—The finished material shall be free from cracks, surface flaws, and lamination. It shall also have a workmanlike finish, and must not have been hammer-dressed.
3. **Testing and Inspection.**—The following tests and inspections shall be made at the place of manufacture prior to despatch; but, in the event of any of the material proving unsatisfactory in the course of being worked into boilers, such material shall be rejected, notwithstanding any previous certificate of satisfactory testing, and such further tests of the material from the same charge may be made as the Surveyor may consider desirable.
4. **Tensile Test Pieces.**—The tensile strength and ductility shall be determined from Standard test pieces cut lengthwise or crosswise from the rolled material. When material is annealed or otherwise treated before despatch, the test pieces shall be similarly and simultaneously treated with the material before testing.

Plates, Angles and Tee Bars.—Wherever practicable the rolled surfaces shall be retained on two opposite sides of the test piece. The elongation shall be measured on a Standard test piece having a gauge length of 8 inches.

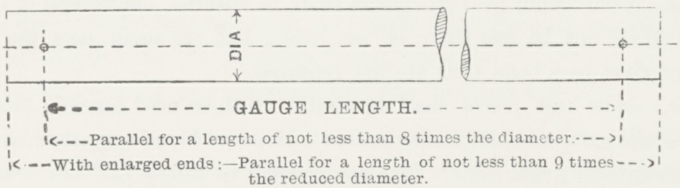
For material more than ·875 in. in thickness the width of the test piece between the gauge points shall not exceed $1\frac{1}{2}$ ins.; for material ·875 in. to ·375 in. in thickness, inclusive, the width shall not exceed 2 ins.; for material less than ·375 in. in thickness the width shall not be more than $2\frac{1}{2}$ ins. In other respects the test pieces shall conform generally to the Standard test piece A.

TEST PIECE A.



Round Bars:—Round bars may be tested either full size as rolled, or turned down when the diameter is considerable. The test piece shall have a gauge length of not less than 8 times its diameter, and a sectional area of not less than $\frac{1}{4}$ square inch. When enlarged ends are used the length of the parallel portion shall not be less than 9 times the reduced diameter, *see* Standard test piece B.

TEST PIECE B.



Any straightening of test pieces which may be required shall be done cold.

5. **Mechanical Tests, and Selection of Test Pieces.**—Plates and bars for boilers shall comply with the following mechanical tests. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

6. **Tensile Tests.** Plates:—The tensile breaking strength of steel plates for shells and girders, determined from Standard test pieces, shall be between the limits of 28 and 32 tons per square inch. For plates intended for flanging or welding, and for combustion chambers and furnaces, the tensile breaking strength shall be between the limits of 26 and 30 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation, measured on a Standard test piece having a gauge length of

8 ins., shall not be less than 20 per cent. for material of ·375 in. in thickness and upwards required to have a tensile breaking strength of 28 to 32 tons per square inch; and not less than 23 per cent. for material of ·375 in. in thickness and upwards required to have a tensile breaking strength of 26 to 30 tons per square inch.

Stay, Angle and Tee Bars:—The tensile breaking strength of longitudinal stays and angle and tee bars shall be between the limits of 28 and 32 tons per square inch, with an elongation of not less than 20 per cent. of the gauge length measured on the Standard test pieces A or B. For bars for combustion chamber stays the tensile breaking strength shall be between 26 and 30 tons per square inch, with an elongation of not less than 23 per cent. of the gauge length measured on the Standard test piece B.

For material under ·375 in. in thickness the elongation may be not more than 3 per cent. below the above-named elongations.

Rivet Bars:—The tensile breaking strength of rivet bars shall be between the limits of 26 and 30 tons per square inch of section, with an elongation of not less than 25 per cent. of the gauge length measured on the Standard test piece B. The bars may be tested the full size as rolled.

7. **Number of Tensile Tests.** Plates.—One tensile test shall be taken from each plate as rolled. For plates exceeding $2\frac{1}{2}$ tons in weight one tensile test shall be taken from each end.

Angle, Tee, Rivet and Stay Bars:—At least two tensile tests for angle bars, tee bars, rivet bars, and stay bars shall be taken from each charge; but when the number of the bars, as rolled, from one charge exceeds 15, an additional tensile test shall be made for each further batch of 15 bars or portion thereof.

Should a tensile test piece break outside the middle half of its gauge length, and the elongation be less than that required by the Rules the test may, at the Maker's option, be discarded and another test be made of the same plate or bar.

8. **Bend Tests.** Cold bends:—Test pieces shall be sheared lengthwise or crosswise from plates or bars, and shall not be less than $1\frac{1}{2}$ ins. wide, but for small bars the whole section may be used. For rivet bars bend tests are not required.

Temper Bends:—The test pieces shall be similar to those used for cold bend tests. For temper bend tests the samples shall be heated to a blood red and quenched in water at a temperature not exceeding 80 degrees Fahr. The colour shall be judged indoors in the shade.

In all cold bend tests, and in temper bend tests on samples ·5 in. in thickness and above, the rough edge or arris caused by shearing may be removed by filing or grinding, and samples 1 in. in thickness and above may have the edges machined, but the test pieces shall receive no other preparation. The test pieces shall not be annealed unless the material from which they are cut is similarly annealed, in which case the test pieces shall be similarly and simultaneously treated with the material before testing.

For both cold and temper bends the test piece shall withstand, without fracture, being doubled over until the internal radius is equal to $1\frac{1}{2}$ times the thickness of the test piece, and the sides are parallel.

For small sectional material these bend tests may be made from the flattened bar.

Bend tests may be made either by pressure or by blows.

9. **Number of Bend Tests.**—Plates:—One cold or temper bend test shall be taken from each plate as rolled. For plates exceeding $2\frac{1}{2}$ tons in weight one bend test shall be taken from each end —one bend test to be temper and the other cold.

Angle and Stay bars:—A cold or temper bend test shall be made from each angle or stay bar rolled.

10. **Tests for Manufactured Rivets.**—Rivets selected by the Surveyor from the bulk shall withstand the following tests:—

(*a*) The rivet shanks are to be bent cold, and hammered until the two parts of the shank touch in the manner shown in Fig. 1, without fracture on the outside of the bend.

(*b*) The rivet heads are to be flattened, while hot, in the manner shown in Fig. 2, without cracking at the edges. The heads are to be flattened until their diameter is $2\frac{1}{2}$ times the diameter of the shank.

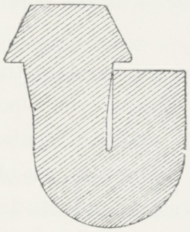


FIG. 1.

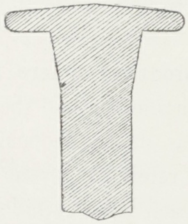


FIG. 2.

11. **Additional Tests before Rejection.**—Should any of the test pieces first selected by the Surveyor not fulfil the test requirements, two further tests may be made from the same plate or bar, but should either of these fail, the plate or bar from which the test pieces were cut shall be rejected. In all such cases further tests shall be made before any material from the same charge can be accepted.

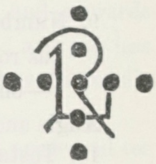
12. **Branding.**—Every plate and bar shall be clearly and distinctly marked by the Maker in two places with the Society's brand, thus:— indicating that the material has complied with the Society's tests.

No plates or bars bearing this brand shall be forwarded from the Steel Works until the prescribed tests have been made by the Surveyor, and the mill sheets have been signed by him. All plates and bars shall also be legibly stamped in two places with the Maker's name or trade mark, and the place where made. They shall also be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

13. **Maker's Certificate.**—Before the mill sheets are signed by the Surveyor, the Maker shall furnish him with a certificate guaranteeing that the material has been made by the Open Hearth process, and that it has been subjected to, and has withstood satisfactorily, the tests above described in the presence of the Surveyor. The following form of certificate will be accepted if printed on each mill sheet with the name of the firm, and initialled by the Test House Manager:—

"We hereby certify that the material described below has been made by the Open Hearth process, and is that which has been satisfactorily tested in the presence of the Surveyor in accordance with the Rules of Lloyd's Register."

14. **Defacing of Rejected Material.**—In the event of the material failing, in any case, to withstand the prescribed tests, the Surveyor shall see that the Society's brand stamped on the plates and bars by the Maker has been defaced by punch marks extending beyond the brand in the form of a cross, thus :—



denoting that the material has been rejected.

15. **Facilities for Inspection.**—The Maker shall adopt a system of marking the ingots, billets, slabs, plates, bars, &c., which will enable all finished material to be traced to the original charge, and the Surveyor must be given every facility for tracing all plates and bars to their respective charges, and for witnessing the required tests. When he is satisfied with the material and with the results of the tests, he shall be furnished with two copies of the advice notes of the material for his signature, one of which is to be forwarded by the manufacturer to the Boiler Maker, and the other is to be forwarded by the Surveyor to the Surveyors at the port where the boiler is to be built.

16. **Steel not produced where Rolled.**—Where steel is not produced in the works at which it is rolled, a certificate shall be supplied to the Surveyor, stating the Open Hearth process by which it was made, the name of the Steel Maker who supplied it, also the numbers of the charges for reference to the books of the Steel Maker. The number of the charge shall be marked on each ingot or billet for the purpose of identification, and the finished plates and bars shall also be legibly stamped in two places with the Maker's name or trade mark, and the place where made. They shall also be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

17. **General.**—Besides the foregoing tests, samples of all material may be subjected to additional tests at the discretion of the Surveyors.

ENGINES.

20. The engines are to be fitted with two feed-pumps, each capable of supplying the boilers; the pumps, &c., to be so arranged that either can be overhauled whilst the other is at work.

21. The engines are to be fitted with two bilge pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

22. In engines of 70 H.P. and under, one feed-pump and one bilge-pump will be deemed sufficient, provided they are of adequate capacity.

The main feed pumps may be worked by independent engines provided they are fitted with automatic regulators for controlling their speed. If only one such pump is fitted for the main feed, the auxiliary feed pump required by paragraph 25 should also be fitted with an automatic speed regulator.

23 A bilge injection, or a bilge suction to the circulating pump, is to be fitted.

24. The engine bilge pumps are to be fitted capable of pumping from each compartment of the vessel, the peaks excepted. All bilge suction pipes are to be fitted with strum boxes or strainers, so constructed that they can be cleared without breaking the joints of the suction pipes. The total area of the perforations in the strainers should be not less than double that of the cross section of the suction pipe. The mud boxes and roses in engine room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

25. A steam pump is to be provided capable of supplying the boilers with water; this pump to be provided with suctions to the hotwell and also to the sea. A steam pump is to be so fitted as to pump from each compartment, to deliver water on deck, and if no hand pump is fitted in engine room it must be fitted to be worked by hand. In small vessels in which only one steam pump is fitted, it must comply with all the requirements.

26. In all steam pipes provision is to be made for expansion and contraction to take place without unduly straining the pipes, and all main steam pipes are to be tested by hydraulic pressure to twice the working pressure, in the presence of the Engineer Surveyor.

27. All discharge-pipes to be, if possible, carried above the deep load-line, and to have discharge valves fitted on the plating of the vessel in an accessible position.

28. No pipes are to be carried through the bunkers without being properly protected.

29. Bilge suction-pipes to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

SHAFTS.

30. All shafts are to be made of good material, are to be examined when rough turned and when finished. In the case of screw shafts scrap steel is not to be used. It is recommended that these be made of ingot steel or forged from blooms made from rolled iron bar of good fibrous quality.

A tensile and a bend test are to be made on pieces cut from one end of each ingot steel shaft forging, the piece from which they are cut being of the same size as the body of the forging. In the case of built crank shafts the tests are to be taken from the material of the crank pins and journals, not from the webs. If more than one piece is forged from one ingot, one test only will be required from the ingot. The tensile strength is not to be less than 27 tons per square inch nor to exceed 32 tons per square inch. The elongation is not to be less than 30 per cent. in a length of two inches measured on a plain portion turned not more than three-quarters of an inch diameter. The bend test piece is to be made one inch square and must be capable of being bent cold without fracture, through an angle of 180 degrees over a radius not greater than half-an-inch.

31. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

32. The length of the stern bush is to be at least four diameters of the shaft. It is recommended that the shaft liner should be continuous the whole length of the stern tube, and that the after end should be tapered in thickness and made watertight in the propeller boss. If the liner is made in two pieces the joint should be burned. If the liner does not fit tightly at the part between the bearings in the stern tube, the space between the shaft and the liner should be charged or "forced" with a plastic material insoluble in water and non-corrosive. If two liners are used, it is recommended that they be tapered in thickness at the ends, and that the shaft should be lapped or protected between the liners. In this case, and also if no liners are used, the diameter of the shaft should be $\frac{21}{20}$ths of that required for a shaft with a continuous liner.

For dimensions of shafts, see the formula in paragraph 60.

STEEL CASTINGS.

33. **Steel Castings** may be used for engine purposes provided they fulfil the Committee's requirements, which are as follow :—

1. For purposes for which **Cast Iron** is ordinarily employed, such as propeller bosses and blades, bed plates, engine framing and columns, brackets, weigh-shaft levers, pistons, cylinder covers, eccentric straps, bearing bushes, &c., the castings must be sound, and are to be subjected to such drop and hammering tests as are practicable.
2. For shafts or parts of shafts, and for purposes for which **forgings** are ordinarily employed, the material must also be subjected to the following tests :—
3. A tensile test is to be made from a piece taken from each casting. The tensile strength is not to exceed 30 tons per square inch, and the elongation is not to be less than 10 per cent. in a length of 8 inches, and a cold bending test, turned to $1\frac{1}{4}$ inches diameter or planed to $1\frac{1}{4}$ inches square, is to be capable of being bent without fracture through an angle of 90° over a radius not greater than $1\frac{3}{4}$ inches.
4. All steel castings are to be thoroughly annealed.

COCKS, PIPES, AND SEA CONNECTIONS.

34. With a view to insuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and vessels having *new engines or boilers* :—

35. All sea-cocks to be fitted on the plating of the vessel above the level of the stoke-hold and engine-room platforms, or attached to Kingston valves of a height sufficient to lift them up to the level of these platforms.

36. The bolts securing all cocks or sea connections to the plating of the vessel are to be tapped into the plating of the vessel or fitted with countersunk heads.

37. The blow-off cocks on the plating of the vessel are to be fitted with spigots passing through the plating, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut.

38. Cocks and valves connecting all suction pipes to be fixed above the stoke-hold and engine-room platforms.

39. The arrangements of pumps, bilge injections, suction and delivery pipes, is to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement to be reported to the Committee.

SPARE GEAR.

40. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz. :—

2 connecting rod or piston rod top-end bolts and nuts.
2 connecting rod bottom-end bolts and nuts.
2 main bearing bolts.
1 set of coupling bolts.
1 set of feed and bilge pump valves.
1 set of piston springs (where common springs are used).
A quantity of assorted bolts and nuts.
Iron of various sizes.

In addition to the foregoing the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

Crank shaft.
Propeller shaft.
Propeller, or a full set of blades.
Stern bush, or lignum vitæ lining for bush.
1 pair of connecting rod brasses.
1 pair of cross head brasses.
1 set of link brasses.
1 eccentric strap complete.
Air pump rod.
Circulating pump rod.
H. P. valve spindle.
L. P. valve spindle.
1 set of check valves.
6 cylinder cover bolts.
6 junk ring bolts.
4 valve chest cover bolts.
2 dozen boiler tubes.
3 dozen condenser tubes.
1 cylinder escape valve and spring.
1 set of safety valve springs.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

CYLINDRICAL SHELLS OF IRON BOILERS.

41. The strength of circular shells of iron boilers to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where C = co-efficient as per following table,

T = thickness of plate in inches,

D = mean diameter of shell in inches,

B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $B = \frac{p - d}{p} \times 100.$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$B = \frac{n \times a}{p \times T} \times 90$ with iron rivets in iron plates with drilled holes.

(In case of rivets being in double shear, 1·75*a* is to be used instead of *a*.)

where p = pitch of rivets,

d = diameter of rivets,

a = sectional area of rivets,

n = number of rows of rivets.

Mem.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula the actual strength may be taken in the calculation.

TABLE OF CO-EFFICIENTS.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates $\frac{1}{2}$-inch thick and under.	For Plates $\frac{3}{4}$-inch thick and above $\frac{1}{2}$-inch.	For Plates above $\frac{3}{4}$-inch thick.
Lap Joint, Punched Holes	155	165	170
Lap Joint, Drilled Holes	170	180	190
Double Butt Strap Joint, Punched Holes	170	180	190
Double Butt Strap Joint, Drilled Holes	180	190	200

Note.—The inside butt strap to be at least $\frac{3}{4}$ of the strength of the longitudinal joint.

CYLINDRICAL SHELLS OF STEEL BOILERS.

42. The strength of cylindrical shells of steel boilers is to be calculated from the following formula :—

$$\frac{C \times (T - 2) \times B}{D} = \text{working pressure in lbs. per square inch.}$$

where D = mean diameter of shell in inches.

T = thickness of plate in sixteenths of an inch.

$21 \times \frac{28}{27} = 21.8$ C = 21 when the longitudinal seams are fitted with double butt straps of equal width.

C = 20·25 when they are fitted with double butt straps of unequal width, only covering on one side the reduced section of plate at the outer lines of rivets.

$19.5 \times \frac{28}{27} = 20.2$ C = 19·5 when the longitudinal seams are lap joints.

If the minimum tensile strength of shell plates is 28 or 29 tons per square inch instead of 27 tons per square inch these values of C may be correspondingly increased.

B = the least percentage of strength of longitudinal joint found as follows :—

For plate at joint $B = \frac{p - d}{p} \times 100$

For rivets at joint $B = \frac{n \times a}{p \times t} \times 85$ where steel rivets are used.

$B = \frac{n \times a}{p \times t} \times 70$ where iron rivets are used.

where p = pitch of rivets in inches.

t = thickness of plate in inches.

d = diameter of rivet holes in inches.

n = number of rivets used per pitch in the longitudinal joint.

a = sectional area of rivet in square inches.

In case of rivets in double shear $1{\cdot}75a$ is to be used instead of a.

Note.—The inside butt strap to be at least $\frac{3}{4}$ of the strength of the longitudinal joint.

Note.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be $\frac{2}{3}$ of those given in the preceding tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted to be stayed from the top of the dome or otherwise stiffened.

STAYS.

43. The strength of stays supporting flat surfaces is to be calculated from the smallest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

44. **Iron Stays.**—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, and for all stays which are welded 6,000 lbs. per square inch ; for unwelded stays above $1\frac{1}{2}$ inches smallest diameter, 7,500 lbs. per square inch.

45. **Steel Stays.**—For **screw** stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 8,000 lbs. per square inch ; for **screw** stays above $1\frac{1}{2}$ inches smallest diameter, 9,000 lbs. per square inch. For other stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 9,000 lbs. per square inch, and for stays exceeding $1\frac{1}{2}$ inches smallest diameter, 10,000 lbs. per square inch. No steel stays are to be welded.

46. **Stay Tubes.**—The stress is not to exceed 7,500 lbs. per square inch.

FLAT PLATES.

47. The strength of flat plates supported by stays is to be taken from the following formula :—

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,

P^2 = square of pitch in inches. If the pitch in the rows is not equal to that between the rows, then the mean of the squares of the two pitches is to be taken.

C = 90 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with screw stays with riveted heads,

C = 100 for iron or steel plates above $\frac{7}{16}$ thick fitted with screw stays with riveted heads,

C = 110 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with stays and nuts,

C = 120 for iron plates above $\frac{7}{16}$ thick, and for steel plates above $\frac{7}{16}$ and under $\frac{9}{16}$ thick, fitted with screw stays and nuts,

C = 135 for steel plates $\frac{9}{16}$ thick and above, fitted with screw stays and nuts,

C = 140 for iron plates fitted with stays with double nuts,

C = 150 for iron plates fitted with stays with double nuts and washers outside the plates, of at least $\frac{1}{3}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 160 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, of at least $\frac{2}{5}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 175 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, when the washers are at least $\frac{2}{3}$ of the pitch in diameter and of the same thickness as the plates.

For iron plates fitted with stays with double nuts and doubling strips riveted to the outside of the plates, of the same thickness as the plates, and of a width equal to $\frac{2}{3}$ the distance between the rows of stays, C may be taken as 175, if P is taken to be the distance between the rows, and 190 when P is taken to be the pitch between the stays in the rows.

For steel plates, other than those for combustion chambers, the values of C may be increased as follows :—

C = 140 increased to 175,
150 „ 185,
160 „ 200,
175 „ 220,
190 „ 240.

48. If flat plates are strengthened with doubling plates securely riveted to them, having a thickness of not less than $\frac{2}{3}$ of that of the plates, the strength to be taken from

$$\frac{C \times (T + \frac{t}{2})^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where t = thickness of doubling plates in sixteenths, and C, T and P are as above.

NOTE.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

49. For steel tube plates in the nest of tubes the strength to be taken from

$$\frac{140 \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = the thickness of the plates in sixteenths of an inch,
P = the *mean* pitch of stay tubes from centre to centre.

For the wide water spaces between the nests of tubes the strength to be taken from

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where P = the horizontal distance from centre to centre of the bounding rows of tubes, and
C = 120 where the stay tubes are pitched with two plain tubes between them and are not fitted with nuts outside the plates,
C = 130 if they are fitted with nuts outside the plates,
C = 140 if each alternate tube is a stay tube not fitted with nuts,
C = 150 if they are fitted with nuts outside the plates,
C = 160 if every tube in these rows is a stay tube and not fitted with nuts,
C = 170 if every tube in these rows is a stay tube and each alternate stay tube is fitted with nuts outside the plates.

50. The thickness of tube plates of Combustion Chambers in cases where the pressure on the top of the chambers is borne by these plates is not to be less than that given by the following rule :—

$$T = \frac{P \times W \times D}{1750 \times (D - d)}$$

where P = working pressure in lbs. per square inch.
W = width of Combustion Chamber between plates in inches.
D = horizontal pitch of tubes in inches.
d = inside diameter of plain tubes in inches.
T = thickness of tube plates in sixteenths of an inch.

GIRDERS.

51. The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L-P) \times D \times L} = \text{working pressure in lbs. per square inch ;}$$

where L = width between tube plates, or tube plate and back plate of chamber

P = pitch of stays in girders,

D = distance from centre to centre of girders,

d = depth of girder at centre,

T = thickness of girder at centre. All these dimensions to be taken in inches.

Wrought Iron.

$$C = \begin{cases} 6{,}000, & \text{if there is one stay to each girder.} \\ 9{,}000, & \text{if there are two or three stays to each girder.} \\ 10{,}000, & \text{if there are four or five stays to each girder.} \\ 10{,}500, & \text{if there are six or seven stays to each girder.} \\ 10{,}800, & \text{if there are eight stays or above to each girder.} \end{cases}$$

Wrought Steel.

$$C = \begin{cases} 6{,}600, & \text{if there is one stay to each girder.} \\ 9{,}900, & \text{if there are two or three stays to each girder.} \\ 11{,}000, & \text{if there are four or five stays to each girder.} \\ 11{,}550, & \text{if there are six or seven stays to each girder.} \\ 11{,}880 & \text{if there are eight stays or above to each girder.} \end{cases}$$

CIRCULAR FURNACES.

52. The strength of plain furnaces to resist collapsing to be calculated as follows :—

Where the length of the plain cylindrical part of the furnace exceeds 120 times the thickness of the plate, the working pressure is to be calculated by the following formula :—

$$\frac{1{,}075{,}200 \times T^2}{L \times D} = \text{working pressure in lbs. per square inch ;}$$

Where the length of the plain cylindrical part of the furnace is less than 120 times the thickness of the plate, the working pressure is to be calculated by the following formula :—

$$\frac{50 \times (300T - L)}{D} = \text{working pressure in lbs. per square inch,}$$

where D = outside diameter of furnace in inches,

T = thickness of plates in inches,

L = length of plain cylindrical part in inches, measured from the centres of the rivets connecting the furnaces to the flanges of the end and tube plates, or from the commencement of the curvature of the flanges of the furnace where it is flanged or fitted with Adamson rings.

53. In the furnaces referred to below the formulæ given are applicable if the steel used has a tensile strength of not less than 26 nor more than 30 tons per square inch. If the material of furnaces has a

less tensile strength than 26 tons per square inch, then for each ton per square inch which the minimum tensile strength falls below 26, the co-efficient is to be correspondingly decreased by $\frac{1}{26}$th part.

54. The strength of corrugated furnaces made on Fox's, Morison's, Deighton's, or Beardmore's plan, to be calculated from

$\frac{1259}{26} = 48.4.$

$$\frac{1,259 \times (T-2)}{D} = \text{working pressure in lbs. per square inch.}$$

55. The strength of spirally corrugated furnaces is to be calculated from the following formula :—

$$\frac{912 \times (T-2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,
and D = outside diameter of corrugated furnaces, in inches.

56. The strength of Improved Purves' furnaces with ribs 9 inches apart, and of Brown's Cambered furnaces with ribs either 8 inches or 9 inches apart, to be calculated from the following formula :—

$$\frac{1,160 \times (T-2)}{D} = \text{working pressure in lbs. per square inch.}$$

where T = thickness of plate in sixteenths of an inch,
and D = smallest outside diameter of furnaces, in inches.

57. The strength of the Leeds Forge bulb furnace is to be calculated from the following formula :—

$$\frac{1259 \times (T-2)}{D} = \text{working pressure in lbs. per square inch ;}$$

where T = thickness of plate in sixteenths of an inch,
and D = smallest outside diameter in inches.

58. The strength of Holmes' patent furnaces, in which the corrugations are not more than 16 inches apart from centre to centre, and not less than 2 inches high, to be calculated from the following formula :—

$$\text{Working pressure in lbs. per square inch} = \frac{945 \times (T-2)}{D}$$

where T = thickness of plain portions of furnace in sixteenths of an inch,
and D = outside diameter of plain parts of the furnace in inches.

DONKEY BOILERS.

59. The iron used in the construction of the fire boxes, uptakes, and water tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any cases where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULES FOR DETERMINING SIZES OF SHAFTS.

60. The diameters of intermediate shafts are to be not less than those given by the following formula :—

For Compound Engines with two cranks at right angles—

$$\text{Diameter of intermediate shaft in inches} = (\cdot 04\, A + \cdot 006\, D + \cdot 02\, S) \times \sqrt[3]{P}$$

For Triple expansion engines with three cranks at equal angles—

$$\text{Diameter of intermediate shaft in inches} = (\cdot 038\, A + \cdot 009\, B + \cdot 002\, D + \cdot 0165\, S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with two cranks at right angles—

$$\text{Diameter of intermediate shaft in inches} = (\cdot 034\, A + \cdot 011\, B + \cdot 004\, C + \cdot 0014\, D + \cdot 016\, S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with three cranks—

$$\text{Diameter of intermediate shaft in inches} = (\cdot 028\, A + \cdot 014\, B + \cdot 006\, C + \cdot 0017\, D + \cdot 015\, S) \times \sqrt[3]{P}$$

For Quadruple expansion engines with four cranks—

$$\text{Diameter of intermediate shaft in inches} = (\cdot 033\, A + \cdot 01\, B + \cdot 004\, C + \cdot 0013\, D + \cdot 0155\, S) \times \sqrt[3]{P}$$

where A = diameter of High Pressure Cylinder in inches,
B = diameter of first Intermediate Cylinder in inches,
C = diameter of second Intermediate Cylinder in inches,
D = diameter of Low Pressure Cylinder in inches,
S = Stroke of Pistons in inches,
P = Boiler pressure above atmosphere in lbs. per square inch.

61. The diameter of crank shaft, and of thrust shaft under the collars, to be at least $\frac{21}{20}$ths of that of the intermediate shaft. The diameter of thrust shaft may be tapered off at each end to the same size as that of the intermediate shaft.

62. The diameter of the screw shaft to be equal to the diameter of intermediate shaft (found as above) multiplied by $\left(\cdot 63 + \frac{\cdot 03\, P}{T}\right)$, but in no case to be less than $1\cdot 07\, T$,

where P is the diameter of propeller, and
T the diameter of intermediate shaft, both in inches.

This size of screw shaft is intended to apply to shafts fitted with continuous liners the whole length of the stern tube, as provided for in paragraph 32. If no liners are used or if two separate liners are used, the diameter of the shaft should be $\frac{21}{20}$ths that given above.

The diameter of screw shaft is to be tapered off at the forward end to the size of the crank shaft.

63. Note.—The Rules are intended to apply to Two Cylinder Compound Engines, in which the ratio of areas of Low and High Pressure Cylinders does not exceed 4·5 to 1 ; to Triple Expansion Engines in

which it does not exceed 9 to 1; to Quadruple Expansion Engines in which it does not exceed 12 to 1; and in all cases, as regards the stroke, in which the length of stroke is not less than one half the diameter or greater than the diameter of the Low Pressure Cylinder. Engines of extreme proportions beyond these limits being specially submitted to be dealt with on their merits.

PERIODICAL SURVEYS. (*See* N.B.)

64. The machinery and boilers of all steam ships and the donkey boilers of sailing vessels are to be surveyed annually if practicable, and in addition are to be submitted to a Special Survey upon the occasions of the vessels undergoing the Special periodical Surveys Nos. 1, 2, and 3, prescribed in the Rules, unless the machinery and boilers have been specially surveyed within a period of twelve months.

65. At these Special Surveys, and on other occasions if deemed necessary by the Surveyors, the propeller, stern-bush, sea connections, and their fastenings, are to be examined while the vessel is in dry dock.

66. The stern shaft is to be examined annually and drawn at intervals of not more than two years.*

67. The cylinders, pistons, slide valves, crank and tunnel shafts, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

68. The arrangements of cocks, pipes, bilge-suctions, roses, &c., are to be examined.

69. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

70. The safety valves are to be examined and set to the safe working pressure.

71. If satisfactory, these Surveys will be recorded in the Register Book thus :—"LMC7,06" *in red* or "B&MS7,06" *in red*.

72. "LMC" (Lloyd's Machinery Certificate) denotes that the machinery and boilers are fitted in accordance with the Rules; and when followed by a date, indicates that they were found at that time to be in good condition. MS. with a date denotes that the engines at that time were found upon inspection to be in good condition. BS. with a date denotes that the boilers were found upon inspection at that time to be in good condition.

73. "B&MS" (Boilers and Machinery Surveyed), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

74. In the event of either the machinery or boilers appearing to be impaired to such an extent as to render it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

* On the application of owners, the Committee will be prepared to give consideration to the circumstances of any special case.

BOILERS.

75. The boilers of all steam ships and the donkey boilers of sailing vessels are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

76. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure ; the safe working pressure is to be determined by their actual condition.

77. The safety valves are to be examined and set to the safe working pressure.

78. If satisfactory these surveys will be recorded in the Register Book thus :—" BS7,06 " *in red* in the case of steam vessels, and " DBS7,06 " *in red* in the case of sailing vessels.

79. " BS " (Boilers Surveyed) or " DBS " (Donkey Boiler Surveyed), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

80. In the event of the boilers appearing to be impaired to such an extent as to render it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

NB.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

By order of the Committee,

ANDREW SCOTT

Secretary.

71, FENCHURCH STREET, LONDON, E.C.

26th April, 1906.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

USE OF ELECTRIC LIGHT ON BOARD VESSELS.

The following requirements as to the sizes, positions, and protection of the cables, and to the fitting of the cut-outs are now embodied as Rules.

LEADS OR CIRCUITS.

1. The sectional area of the copper wires in the cables should be at least in the proportion of one square inch per 1,000 ampères carried.

2. No single wire of greater size than 14 or of less than 18 standard wire gauge should be used. For portable leads cables composed of stranded wires should be used having sufficient conductivity and flexibility for the purposes intended.

3. The copper used in all wires or cables should have a conductivity of at least 98 per cent. that of pure copper.

4. The insulation resistance of all wires, including portable leads, should be not less than 600 megohms per statute mile, after 24 hours' immersion in sea water.

5. The insulating material used must not appreciably soften if subjected to a temperature of 180° F. If india-rubber insulation is used, the wires should be first covered with a layer of pure rubber, then with a separator, then with a layer of vulcanizing india-rubber, and then with a layer of india-rubber coated tape. The whole should then be vulcanized together. The cable should afterwards be satisfactorily protected, preferably with a braided covering of waterproof fibre.

6. Wires which are insulated with any other material than india-rubber should fulfil the same conditions as to insulation resistance, and should be of equal durability with those above specified.

JOINTS.

7. Joints in branches, or of branches with leads of small circuits, must be made in properly constructed watertight junction boxes, or should have the copper wires thoroughly soldered and the insulation carefully carried out, all the joints being made watertight. Joints in flow and return wires should not be made opposite one another. All joints should be in accessible positions, none being made in bunkers, cargo spaces, or spaces which may at any time be used for carrying cargo, stores or baggage.

8. For soldering wires, resin only should be used as a flux.

9. Where practicable, the leads should be placed where they can always be accessible; if they are laid in wood battens the covers should be screwed on, not nailed, and care should be taken that the casings are so arranged that water will not lodge in them. Cables which are properly covered with protective metal sheathing, or which are protected by galvanized wire armouring, may be unencased. They should, however, be secured by screwed clips, not by staples. All sharp bends in cables should be avoided.

10. All cables which are liable to be exposed to the weather or moisture should be lead covered, or be otherwise specially protected. Where great heat is experienced, no wood casing should be used, but the cables should be protected by iron casings, or if they are not exposed to mechanical injury, they may be armoured with galvanized wire and fastened to decks or bulkheads with screwed clips spaced not more than 12 inches apart.

11. If cables are led through cargo spaces, coal bunkers, or spaces which may at any time be used for carrying cargo, stores, or baggage, or which are not at all times accessible, they should be strongly protected against damage, preferably by iron casings. If they are led through metal tubes, these must be strongly secured, and should be fitted so that water cannot lodge in them.

Armoured cables may be used without casings or tubes provided they are strongly secured to the under side of decks or to bulkheads by screwed clips and provided they are armoured in conformity with the standard of the Engineering Standards Committee, viz. :—

For cables below $\frac{1}{2}$ inch diameter over lead by galvanized steel wires ·072 diameter, for cables $\frac{1}{2}$ inch to 1 inch over lead by two layers of steel tape each ·03 inch thick, for cables above 1 inch to 2 inches diameter by two layers of steel tape each ·04 inch thick, and for larger cables by two layers of steel tape ·06 inch thick.

12. Where cables pass through beams, bulkheads, or other iron work, they should be led through special fittings of sheet lead, hard wood or vulcanized fibre to prevent their being chafed, and where they pass through decks they should be led through metal tubes lined with wood, or vulcanized fibre, and securely fastened to the decks, standing at such a height above the deck level that water cannot stand above them. Where cables pass through watertight bulkheads the fittings should be provided with brass watertight screwed glands.

13. In vessels having spaces allotted alternately for passengers and cargo, the lamp fittings in these spaces should be removable, and the terminals so arranged that they can be properly covered up with strong metal covers, or the whole of the fittings should be similarly provided with strong metal covers. The main switches and cut-outs should be outside these spaces, or if placed inside, they should be in strong iron boxes provided with iron covers, or otherwise securely arranged to prevent the fittings being tampered with.

DISTRIBUTION.

14. A main switchboard should be fitted in the dynamo room, to which all the main circuits throughout the ship should be brought, a switch and cut-out being fitted thereon for each circuit. The auxiliary switchboards for further sub-division of the current should be placed in conveniently accessible positions, and each such switchboard should be similarly fitted with a separate switch and cut-out for each sub-circuit. Cut-outs should be fitted to each lamp circuit where these are made with reduced size of wire. If vessels are wired on the double-wire system cut-outs should be fitted to each cable of these circuits.

15. In cases where electric lights are used for the mast-head light and side lights, the switches controlling these lights should be placed in a position where they can be controlled by the Officer of the watch, or other responsible person, and cannot be tampered with by other members of the crew, or by passengers, &c.

16. The switchboards should be of slate or other incombustible material. The switches should be on the quick break principle, and should be so constructed that they must be either full "on" or completely "off," that is, they must not be able to remain in an intermediate position. They should have ample rubbing surfaces and their conductivity should not be less than that of the wires connected to them.

17. Cut-outs should be fitted to each main or auxiliary circuit, on the switchboards, as near as possible to the switches of these circuits. If the switchboard is not fitted near the dynamo, or if more than one dynamo may be used on any one circuit, then cut-outs should also be fitted to the main cable as near as possible to each of the dynamo terminals.

18. All other cut-outs should also be in easily accessible places, and as near as possible to the commencement of the cables or wires they protect. They should be mounted on slate or other incombustible bases and be arranged so that the fused metal may not be a source of danger, and where fitted with covers these should be incombustible.

19. All fuses should be of easily fusible and non-oxidizable metal, and should be so proportioned as to melt with a current 100 per cent. in excess of the normal current, that is they should melt with a current in the proportion of 2,000 ampères per square inch of section of the wires they protect. The fuses for branch wires to single lights should, however, if of tin wire, be of not greater size than 22 s.w.g.

20. The fuses for each cable should be made of standard dimensions, so that a large fuse cannot be used for a small cable by mistake, or, if wire fuses are used, permanent instructions should be fitted on or near each switchboard giving particulars of the proper size of fuse for each circuit.

21. In shaft passages and in damp places, all lamp switches and cut-outs should be of a strong watertight pattern, or should be placed in watertight boxes having hinged or portable watertight covers. No switches or cut-outs are to be placed in bunkers.

22. There should be no joints in the cables leading from the dynamo to the main switchboard, nor in those leading from the main to auxiliary switchboards, nor should branches to single lamps be taken off these cables.

23. A voltmeter should be supplied with each installation. If more than one dynamo is fitted neither being capable of the whole of the output, an ampère meter should be supplied with each dynamo.

JOINTS WITH HULL.

24. In vessels fitted on the single-wire system, all the joints with the hull should be placed in accessible positions. Those for single lamps or for small cables should be made with brass screws not less than three-eighths of an inch in diameter, carefully tapped into the iron or steel, having white brass washers, between the wires and the vessel, or the wires should be soldered to brass-faced washers. For larger cables and for the pole of dynamo the cable wires should be properly sweated into brass or copper shoes, which should be bolted to the vessel. The iron or steel where contact is made should be filed bright, and the area of contact should not be less than eight times the section of the copper of the cable.

IN VESSELS CARRYING PETROLEUM.

25. The single wire system must not be adopted for any part of the installation. Switches and cut-outs must not be fitted in places liable to the accumulation of petroleum vapour or gas, and all lamps in places where it is possible for gas to accumulate must be made with an outer glass globe made air tight. All wires in such places are to be lead covered, or the insulation of the cables employed is to be of such a nature as not to be affected by petroleum. No joints of cables, switches, or cut-outs should be fitted in the pump room, but the wires for each lamp therein should be carried to the lamp from a distributing junction box placed outside the pump room or companion.

The following paragraphs referring to the effect of the Electric Light installations upon the Compasses are issued as suggestions, not as Rules.

POSITION OF DYNAMOS AND OF ELECTRIC MOTORS.

26. The position and type of Dynamos and Electric Motors should be such that the compasses will not be affected. Dynamos and large motors should be at least 30 feet from the standard compass.

CABLES.

27. In vessels fitted with continuous current dynamos, and wired on the single-wire system, no single cable should be carried within 15 feet of any compass, and cables conveying heavy currents should be fixed at still greater distance. If it is necessary to fix any cables within this distance, then for all parts of the vessel lighted from this cable the concentric or double-wire system should be adopted, the return wire being carried as near the flow as possible in the vicinity of the compasses.

ADJUSTMENT OF COMPASSES.

28. The compasses should be adjusted with the dynamo not working, after which the vessel's head should be put upon the different courses, with the dynamo running at full speed, and on each course the indications of the compass should be noted with the dynamo running with open circuit and with all possible combinations of the current switched "on" and "off" all circuits passing near the compasses. These indications should be compared with those obtained with the dynamo stopped, and any serious deflections of the compasses remedied before the vessel sails.

The requirements in paragraphs 3 to 8 inclusive, referring to the quality of the material used, or to the workmanship employed, are embodied as rules; but as the quality of the material can only be tested at the Cable Makers' works, and as the workmanship of the joints cannot be examined or tested after completion, the guarantee of the Electrical Engineers will be required as to these points.

By order of the Committee,

ANDREW SCOTT,

Secretary.

LONDON.—*15th December, 1904.*

NOTICE No. 999.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

REFRIGERATING MACHINERY AND APPLIANCES.

NOTICE IS HEREBY GIVEN that the Committee of this Society have decided that upon the application of the owners of vessels fitted for carrying refrigerated cargoes, they will authorize their Surveyors to survey the refrigerating machinery and appliances, and in those cases where the following conditions are complied with and a satisfactory report is received from the Surveyor, certificates of these Surveys will be issued and the notation R.M.C. with date (in red) made against the vessel's name in the Society's Register Book, and in the special list of vessels fitted with refrigerating appliances. The name of maker and description and number of refrigerating machines, whether single or duplex, and the refrigerating power of the machines will be recorded in the special list in the Register Book, as also the number and capacity of insulated cargo chambers and the nature of insulation and the method employed for cooling the holds.

1. The insulation must be sound and in good order and of efficient construction. The details of construction showing the amount and nature of the insulating material employed in the various parts are to be reported to the Committee.

Bilge suction and sounding pipes and ballast tank air and sounding pipes, passing through insulated spaces, should be well insulated to prevent their being frozen up.

It is *recommended* that the wood-work of the insulation over tunnel tops be fastened with brass screws to facilitate the examination of this part, and that extra strong battens of American Elm be fitted upon it under the hatches, secured by brass screws. Also that insulated removable portions be arranged in

the bulkhead insulation, where required, to give easy access to sluice valves and bilge suction roses. The bottoms, sides and coamings of all insulated hatches and limbers should be painted to prevent decay.

Thermometer tube flanges and covers should be arranged so that water does not run down and freeze in them when taking the temperature.

Cargo battens should be fastened to the floor or deck and to the sides of the chambers previous to loading the homeward cargo. Those to the sides of the chambers should be at least $1\frac{1}{2}$ inches in depth and 2 inches wide. One batten should be placed over each frame or ground, the others being intermediately arranged so that the spacing should be about 9 inches apart, edge to edge. The battens on the floor and decks should be at least $2'' \times 2''$.

Where the brine system of refrigerating is employed, the brine circulating pipes and tanks should be ungalvanised on the inside.

In cases where internally galvanised tanks and cooling pipes have been fitted, the brine cooling and return tanks, if closed, should be provided with two ventilating pipes communicating with the atmosphere. If the tanks are not closed, the cooling room should be efficiently ventilated.

2. The refrigerating machinery is to be of approved construction and of sufficient power to maintain the necessary low temperature in the cargo chambers in tropical climates when running 18 hours per day. For cargo capacities of above 70,000 cubic feet the machinery is to be either duplex or in duplicate.

3. A sufficient amount of spare gear is to be supplied and stowed where it is readily accessible. When two similar machines are fitted, each connected to different cargo compartments, one set of spare gear suitable for either machine will suffice.

Where one single dry air machine is fitted to each compartment, the following will be required :—

1 crank shaft with eccentric sheaves, complete.
1 piston rod and nuts for steam and air cylinders.
1 piston, complete, for each steam and air cylinder.
1 cylinder cover for each pattern used in steam and air cylinders.
1 eccentric strap.
1 eccentric rod.
1 slide valve spindle and nuts for steam and air cylinders, for each pattern used.
Half set of air valves and seats for air compressor.
1 set of inlet and outlet valves and 1 valve face (if fitted) for air expansion cylinder.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
1 set of valves for air, circulating, feed and bilge pumps.
50 suction springs.
50 delivery springs.
50 buffer springs.
Assorted bolts, studs and nuts.

In addition to the foregoing it is recommended that the following be supplied :—

1 pair main bearing brasses, complete.
1 set of piston rod and connecting rod brasses.
Main and cut-off valves for each steam cylinder.
False valve face for each pattern fitted.
1 air pump bucket and rod.
1 set of escape valve springs.
6 tubes and 24 ferrules for condenser.
6 tubes for cooler.
6 tubes for air drying chamber.
A quantity of packings and joint rings.

Where one duplex or two single dry air machines are fitted to each compartment the following will be required :—

1 set of piston springs for each steam cylinder.
1 cylinder cover for each pattern used in air compression and expansion cylinders.
1 slide valve spindle and nuts for steam and air cylinders for each pattern used.
Half set of air valves and seats for air compressor.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
1 set of valves for air, circulating, feed and bilge pumps.
20 suction springs.
40 delivery springs.
40 buffer springs.
Assorted bolts, studs and nuts.

In addition to the foregoing it is recommended that the following be supplied :—

1 crank shaft.
1 piston for each steam cylinder.
1 piston rod and nuts for steam and air cylinders.
1 piston, complete, for air compressor ; and 1 for air expansion cylinder.
1 set of connecting rod and crosshead brasses.
1 inlet and 1 outlet valve and valve face (if fitted) for air expansion cylinder.
1 air pump bucket and rod.
1 eccentric sheave, strap, and rod.
1 set of escape valve springs.
6 tubes and 24 ferrules for condenser.
6 tubes for cooler and 6 for air drying chamber.
A quantity of packings and joint rings.

Where one single ammonia or carbonic anhydride compression machine is fitted :—

1 crank shaft with eccentric sheaves, complete.
Piston and rods complete with nuts for each steam cylinder and gas compressor.
1 valve spindle for each pattern used.
1 set of connecting rod and piston rod bolts.
2 main bearing bolts.
2 eccentric straps and rods.
1 compressor gland and packing, complete.
1 cover for each pattern used.
1 compressor suction and 1 delivery valve with springs and box, complete.
1 brine pump bucket and rod.
1 set of valves for air, circulating, feed, bilge, and brine pumps.
1 pair of connecting rod brasses for fan engines, with bolts, etc., complete.
1 set of piston springs, etc., for fan engine.
1 set of blocks for making all leather packings used.
1 gas regulating valve.
2 distributing and 2 collecting pieces with multiple branches for coils.
Sundry valves, cocks, flanges, and fittings.
Assorted bolts, studs, and nuts.
Quantity of packings and joint rings.

It is also recommended that the following be supplied :—

Main and cut-off valves for steam cylinders.
1 pair main bearing brasses, complete.
1 set of connecting rod and crosshead brasses.
1 air pump bucket and rod.
1 circulating pump bucket and rod.
6 tubes and 24 ferrules for condenser.
Lengths and bends of piping of each size used, together with flanges, couplings, and screwing apparatus for effecting repairs.

For ammonia and carbonic anhydride compression machines the following spare gear will be required, where one duplex or two single machines are fitted to each compartment :—

1 set of connecting rod and piston rod bolts.
2 main bearing bolts.
1 set of piston rings for each size of compressor.
1 compressor gland and packing, complete.

1 cover for each end of gas compressor.

1 compressor suction and 1 delivery valve with springs and box, complete.

1 set of valves for air, circulating, feed, bilge, and brine pumps.

1 brine pump bucket and rod.

1 set of piston springs, rings, etc., for each steam cylinder and for fan engine.

1 pair of connecting rod brasses for fan engines, with bolts, etc., complete.

1 set of blocks for making all leather packings used.

Sundry valves, cocks, flanges and fittings.

Assorted bolts, studs and nuts.

A quantity of joint rings.

It is also recommended that the following be supplied :—

1 crank shaft.

1 piston for each size of steam cylinder, with springs, complete.

1 steam piston rod and nut.

1 compressor piston rod and nuts, complete.

1 set of connecting rod and crosshead brasses.

1 pair main bearing brasses, complete.

1 air pump bucket and rod.

1 circulating pump bucket and rod.

Main and cut-off slide valves.

Main and cut-off valve spindles and nuts.

1 eccentric sheave, strap, and rod.

6 tubes and 24 ferrules for condenser.

Lengths and bends of piping of each size used, together with flanges couplings, and screwing apparatus for effecting repairs.

1 gas regulating valve.

2 distributing and 2 collecting pieces with multiple branches for coils.

4. The required examination will consist of the following :—

Insulation and Trunk-Ways.

The insulation throughout the holds to be carefully examined and tested for dryness and fullness by sounding with a hammer and by boring. The test holes to be afterwards efficiently closed. Special attention is to be paid to the spaces under the snow boxes, trunks and hatches where dampness may accumulate, to the sides under stringers and under decks and to the tunnel tops. All limber hatches to be removed, the limbers cleared, and the suction pipes and roses, sluices and sounding pipes, to be examined. Hatches,

air trunk-ways and thermometer tubes with their connections and fastenings to be examined, and where trunk-ways pass through water-tight bulkheads, the water-tight doors are to be examined and worked.

The trunk-ways should be as air-tight as practicable and their fastenings should be secure.

Machinery.

It is *recommended* that the machinery should be examined and tested under full working conditions upon the vessel's arrival at a home port, before the cargo is *fully discharged.* This is important for facilitating the subsequent examination.

In all cases, the steam pipes, water pipes and connections, the crank shaft and bearings, connecting rods, steam and air cylinders, pistons, slides and valves, compressors and pistons, compressor rods and glands, surface condenser and air or gas coolers, circulating, air, feed and bilge pumps, are to be carefully examined and the condensers and coolers tested if deemed necessary.

The auxiliary machinery, where fitted, is also to be examined.

In dry air machines special attention is to be given to the condition of the air expansion cylinders, their pistons and valves. In other machines special attention is to be given to the condition of the compressors, including the pistons, rods and glands, and to the expansion valve.

The refrigerator coils and their connections and the brine pipes and tanks, where fitted, are to be carefully examined at each survey and tested if deemed necessary.

Where the brine may escape to the bilges, the cement is to be examined at each survey.

The machinery is to be afterwards examined under working conditions, and tested on the snow box or refrigerators, the time and fall of temperature being noted.

If only part of the above examination is held, the certificate will be endorsed with a statement of what is required to complete the survey.

Survey at Loading Ports.

If the machinery and insulation have been examined as mentioned above and a further survey is required at a loading port, this further survey will consist of an inspection to ascertain that the dunnage battens are in good order and that no damage has been sustained to the insulation on the outward voyage, and also of a test of the refrigerating machinery under working conditions, the time of working and the fall of the temperature in the hold being noted.

When the hold is considered to be properly refrigerated, the machinery should be stopped and the temperature noted, and after a stoppage of say two hours the temperature should be again taken and the rise ascertained.

If the brine system of cooling is used, a longer period than two hours should elapse between these records being observed.

Fees.

The following are the charges that will be made for carrying out the above examination in the cases of classed vessels :—

	During Construction.			Subsequent Surveys every Voyage.		
	£	s.	d.	£	s.	d.
For installations under 30,000 cubic feet total capacity ...	4	0	0	2	0	0
„ „ „ 80,000 „ „	6	0	0	3	0	0
„ „ „ 120,000 „ „	8	0	0	4	0	0
„ „ above 120,000 „ „	10	0	0	5	0	0

As regards Unclassed Vessels the fees for the first survey of Refrigerating Machinery and Appliances will be double the amounts in column No. 1 when the survey is held during construction, and double the amounts in column No. 2 when it is held after the Installation has been fitted. Fees for subsequent surveys will be charged in accordance with column No. 2 as printed.

By order of the Committee,

ANDREW SCOTT,

Secretary.

LONDON.—15*th December*, 1904.

EXTRACTS FROM THE RULES

OF THE LATE

UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING),

SHOWING THE CONDITIONS OF CLASSIFICATION, &c.

REVISION OF CERTIFICATE OR SUSPENSION OF CLASS.

The certificate of class will remain good so long as the vessel, under periodical survey, is found worthy of it. In case of defects reported by the Surveyors not being made good, the class of the vessel will be revised or suspended by the Committee.

REFERENCE IN CASE OF COMPLAINT.

Any dispute shall be referred to three Shipbuilders or Engineers, one to be chosen by the Shipowner, one to be chosen by this Committee, and a third to act as umpire, to be chosen by the other two.

SURVEY FEES.

For surveying vessels periodically to ascertain condition, first visit	£1	1	0
For each succeeding visit, when more than one visit is necessary	0	10	6

For special surveys special charges will be made, subject to the control of the Committee.

PERIODICAL SURVEYS.

A thorough survey will be required once in every four years for vessels with an A1* or an A1* certificate; and once in every three years for vessels with an A1, A 1, A or an A certificate. When vessels are abroad at the time they become due for survey, they must be examined on their return to the United Kingdom. The Surveyors are at all times to have free access to examine vessels holding a class in this Registry.

Vessels due for Periodical Survey which leave the United Kingdom without being duly surveyed and passed by the Surveyors to this Registry will have their class suspended until such survey has been properly made. Notice of Suspension of Class will be given in the first Supplement issued after the sailing of the vessel.

Vessels remaining abroad for two years after they become due for Periodical Survey will have their Class suspended until they have been re-surveyed.

First Survey.

The vessel to be placed in dry dock. (The bottom may be cleaned, but should not be recoated before survey.) While in dry dock the rudder, rudder pins and gudgeons, and the whole of the bottom outside, are to be thoroughly examined, and in steamers the connections of the sea-cocks and openings in the bottom are to be examined, to see that they are in an efficient condition.

The holds, and, in steamers, the bunkers also, are to be cleared, the loose ceiling in the flat of bottom is to be lifted, and the Surveyor is to satisfy himself that the bottom inside is in good order, and that the cement is in good condition and satisfactorily adhering to the iron.

He is also to examine the decks, beam ends, and the sides of holds and 'tween decks, all fore and aft. In steamers the bilges and limbers under engines and boilers are to be cleaned out, so as to allow these parts to be examined by the Surveyor. In water-ballast steamers the tanks are to be examined externally and, if the Surveyor deems it necessary, they are to be tested under the pressure due to the ballast-trim water-line, and sufficient ceiling removed to enable the Surveyor to satisfy himself of their tightness. In all cases the tanks are to be emptied, and examined inside. In all vessels any repairs that may be needed are to be done, and the vessel cleaned and painted as may be necessary.

Second Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

A strake of ceiling must be lifted in the bilges to allow an examination of the condition of the iron surfaces there and of the cement.

The windlass must be unhung when the main piece is of wood; and the chain cables must be ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water-line.

Third Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

The whole of the close ceiling must be removed, and all the cement exposed and examined. The vessel must be cleaned and scaled, and, if the Surveyor deems it necessary, the plating and other parts must be drilled as he may direct, to ascertain the thickness. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water line.

Fourth Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

The windlass, if the main piece is of wood, must be unhung, and the chain cables ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to the ballast-trim water line.

Fifth Survey.

The vessel must be submitted to the same survey as before described for "Second Survey."

Sixth Survey or Special Survey.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions :—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

After a vessel has passed her sixth survey, and been approved by the Committee she must be submitted to the same series of surveys, commencing with the "First Survey," and at the same periodical intervals as before.

In steamers, whenever the engines or boilers are removed, a survey is to be held on the vessel's bottom in way thereof, and such repairs as are necessary must be effected before the engines or boilers are replaced.

The preceding rules for periodical surveys are not to limit the Surveyor's discretion, if, in his judgment, it is necessary to make a more complete examination at any time ; and, before completing the report, the Surveyor must, at every periodical survey, satisfy himself that the vessel and her equipment are in a good and efficient condition.

The "Third Survey" must be complied with before the expiration of thirteen years from the date of launch for vessels with an A1* or A1* certificate, ten years for vessels with an A1 or A1 certificate, and nine years for vessels with an A or A certificate ; and the "Sixth Survey" before the expiration of twenty-six years from the date of launch for vessels with an A1* or A1* certificate, twenty years for vessels with an A1 or A1 certificate, and eighteen years for vessels with an A or A certificate.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.

1st September 1885.

HAMMERING TEST.

7. When the percussive test has been passed successfully, to the satisfaction of the inspector the anchor or piece shall be slung and freely put to a hammering test as follows, that is to say, it shall be well hammered over its parts with a sledge hammer weighing not less than 7 lbs., and shall be required to give under this treatment such a clear ring in all its parts as shall satisfy the inspector that the casting is sound, and without flaws existing either originally or developed as the result of the application of the preceding percussive tests.

BENDING TEST.

8. Cast steel may be passed as sufficiently ductile for anchors when a piece of each casting, 8 inches in length, is cut from the casting, turned to 1 inch in diameter, and is then bent cold by hammering through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, without showing signs of flaw or fracture.

9. There must be a piece cast on each cast steel anchor, or on each portion of such anchor when it is made of more than one casting, and such piece must be of sufficient size to enable one test piece of the size before stated to be cut out of it, or it may be (at the discretion of the manufacturer) of sufficient size to enable four test pieces to be cut out of it. If it is only of sufficient size to enable one test piece to be cut out of it, that piece shall be subjected to the bending test named in paragraph 8, and, if it fails to withstand it, the casting is to be condemned.

If the piece is large enough to enable four test pieces to be cut out of it, these four test pieces shall be disposed of as follows, that is to say, one of them shall be turned in a lathe to 1 inch in diameter for a length of 8 inches, and bent cold through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, and if it withstands this test without flaw or fracture, shall be deemed to have withstood a satisfactory test for ductility. If the one test piece does not pass this test, all or any of the other three test pieces may be tested in a similar manner, and if any one of the four tests pieces passes this test, the anchor or part of the anchor, as the case may be, shall be deemed so far satisfactory.

ANNEALING.

10. Each anchor must be properly and sufficiently annealed, and when so annealed, shall be stamped "annealed steel." Annealing is not to be regarded as proper, or efficient, unless the process extends from three days for small anchors, up to six days for large ones.

By order of the Committee,

B. WAYMOUTH,

Secretary.

London.—10*th November*, 1887.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL ANCHORS.

Sir.—The Committee have recently had under consideration a report by the Chief Engineer Surveyor on the several methods of making Steel Castings.

Notwithstanding all the care and precaution that may be taken in forming the moulds, and in the selection of the material used for the purpose, Steel Castings are not infrequently found with more or less serious cracks or defects, owing generally to the uneven rate of cooling.

With regard to Cast Steel Anchors, and with reference to Circular No. 647 (of which I enclose a copy), I am directed to request that you will, in future, examine the Castings of all parts of Steel Anchors intended for Ships classed or proposed to be classed in the Society's Register Book, *before* they are annealed.

You will then be better able to observe any defects which may exist, the skin or scale put on by annealing, rendering it more difficult to detect cracks or other defects, particularly when such cracks or defects have been carefully hammered up and closed.

If on examination any such cracks or defects are observed, the Anchor should not be tested or passed; but if the defects appear to be on the surface only and can be entirely cut out without damaging the Anchor, this may be done in your presence; you must however satisfy yourself that they are entirely removed before you proceed with the tests.

I am, Sir,

Your obedient servant,

HENRY C. SEYFANG, *Secretary*,

Committee on Proving Machines.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

STEEL MANUFACTURERS.

The following firms having applied to have the steel produced by them tested by a Surveyor to this Society and their mode of procedure reported upon, their applications have been complied with and the Surveyors' reports found satisfactory by the Committee.

Firms in the United Kingdom.

Allan, Edgar, & Co. (Lim.), Imperial Steel Works, Tinsley, Sheffield. (*Steel castings.*)
Armstrong (Sir W. G.), Whitworth & Co. (Lim.), Elswick and Openshaw, Manchester. (*Steel castings.*)
Barrow Hæmatite Steel Co. (Lim.), Barrow.
W. Beardmore & Co., Rolling Mills, Steel Works and Foundry, Parkhead, Glasgow.
Bell Bros. (Lim.), Port Clarence, Middlesbrough.
H. Bessemer & Co. (Lim.), Bessemer Works, Sheffield.
Blaydon Iron Works (The), Blaydon. (*Steel castings.*)
Bolckow, Vaughan & Co. (Lim.), Middlesbro'-on-Tees.
Bolton Iron & Steel Co. (Lim.), Bolton, Lancashire.
British Mannesmann Tube Co., Lim., Landore, S. Wales. (*Weldless rolled or drawn steel hollow pillars and davits.*)
John Brown & Co. (Lim.), Sheffield.
Brymbo (The) Steel & Ingot Iron Works, near Wrexham. (*For bars only.*)
Butterley Co. (Lim.), Codnor Park, near Alfreton.
Caledonian Steel Castings Co., Helen Street, Govan, Glasgow.
Cammell Laird & Co. (Lim.), Sheffield.
Cargo Fleet Iron Co. (Lim.),—Works at Cargo Fleet, near Middlesbrough; Registered Offices, Stockton-on-Tees.
Clydebridge Steel Co. (Lim.), Rolling Mills and Steel Works, Cambuslang.
Coltness Iron Co. (Lim.), Melting Furnace and Foundry, Newmains, Lanarkshire.
David Colville & Sons, Rolling Mills and Steel Works (Dalzell Steel and Iron Works), Motherwell.
Consett Iron Co. (Lim.), Blackhill, Durham.
Darlington Forge Co., Darlington. (*Steel castings.*)
Dorman, Long & Co. (Lim.), Middlesbro'-on-Tees, and Port Clarence.
Earl of Dudley's (The) Round Oak Iron and Steel Works (Lim.), Brierley Hill, Staffordshire. (*Sections and Bars.*)
J. Dunlop & Co. (1900) (Lim.), Rolling Mills and Steel Works, Calderbank, N.B.
Thos. Firth & Sons (Lim.), Norfolk Works, Sheffield.
Frodingham Iron & Steel Co. (Lim.), Frodingham, near Doncaster. (*Sections and Bars.*)
Glasgow Iron & Steel Co. (Lim.), Rolling Mills and Steel Works at Wishaw.
Glengarnock Iron and Steel Co. (Lim.), Glengarnock, N.B. (*Sections and Bars.*)
Guest, Keen & Nettlefolds (Lim.),
    Dowlais and Cardiff. (*Plates and Bars.*)
    Castle Works, Tydu, near Newport, Mon. (*Rivet and Stay Bars.*)
    London Works, near Birmingham. (*Rivet Bars only.*)

Hadfield's Steel Foundry Co. (Lim.), Sheffield. (*Steel castings.*)
Hardie & Gordon, Melting Furnaces and Foundry at Dalreoch, Dumbarton.
John Hill & Co., Newport Rolling Mills, Middlesbrough.
P. R. Jackson & Co. (Lim.), Salford Rolling Mills, Manchester.
W. Jessop & Sons (Lim.), Brightside Works, Sheffield.
E. Jopling & Sons, Pallion, Sunderland. (*Steel castings.*)
Lanarkshire Steel Co. (Lim.), Motherwell. (*Sections and Bars.*)
Leeds Forge Co. (Lim.), Leeds.
Lilleshall Co. (Lim.), Offices, Priors Lee Hall, near Shifnal. (*Basic Bessemer Steel—Rivet bars and castings only.*)
S. Osborn & Co., Clyde Steel and Iron Works, Sheffield. (*Steel castings.*)
Palmers' Shipbuilding & Iron Co. (Lim.), Jarrow-on-Tyne.
Park Gate Iron & Steel Co. (Lim.), Rotherham.
Patent Shaft & Axletree Co. (Lim.), Wednesbury.
Richmond Iron & Steel Co., Richmond Iron Works, Stockton-on-Tees. (*Rolling Mills for Stay and Rivet Bars.*)
John Rogerson & Co. (Lim.), Wolsingham. (*Steel Castings.*)
W. Shaw & Co., Middlesbrough. (*Steel castings.*)
Shelton Iron, Steel & Coal Co. (Lim.), Stoke-on-Trent.
South Durham Steel & Iron Co. (Lim.), Stockton-on Tees and West Hartlepool.
John Spencer & Sons, (Lim.), Newburn Steel Works, Newcastle-on-Tyne.
Springfield Steel Co., Melting Furnace and Foundry, 777, London Road, Glasgow.
Steel Company of Scotland (Lim.), Rolling Mills and Steel Works at Newton and Blochairn.
Steel, Peech & Tozer, (Lim.), Sheffield. (*Rivet and Stay bars.*)
Stewarts & Lloyd's (Lim.), Rolling Mills and Steel Works, Mossend.
Swalwell Steel Works, Co. Durham. (*Steel castings.*)
Taylor Bros., Leeds.
Vickers, Sons & Maxim (Lim.), River Don Works, Sheffield; and Barrow.
Weardale Steel, Coal & Coke Co. (Lim.), Spennymoor.
Wigan Coal & Iron Co. (Lim.), Wigan. (*Sections and Bars.*)
Willans & Robinson (Lim.), Queen's Ferry, Flintshire. (*Steel Ingots.*)

FOREIGN FIRMS. ALPHABETICALLY ARRANGED.

In the following list the name of each works is followed by the place of residence of the Surveyor giving attendance thereat.

Aachener Hütten Actien Verein Rothe Erde, Aachen, Germany. (DÜSSELDORF.)
Acciaierie Italiane, Bolzaneto, Italy. (GENOA.)
Aciéries de Grenelle (E. Plichon), 56, Rue Lourmel, Paris. (*Steel castings.*) (HAVRE.)
Aciéries de la Louvière (Gustave Boël), La Louvière, Belgium. (*Sections and Rivet Bars, and Steel Castings.*) (DÜSSELDORF.)
Aciéries de Maromme (E. Breton), Maromme (Seine Inférieure), France. (*Steel Castings.*) (HAVRE.)
Aciéries Hauts-Fourneaux & Forges de Trignac, near St. Nazaire. (NANTES.)
Actien-Gesellschaft Charlottenhütte, Niederschelden (Kreis Siegen), Germany. (*Steel plates and ingots.*) (DÜSSELDORF.)
Actien-Gesellschaft der Dillinger Hüttenwerke, Dillingen-Saar (Rheinpreussen), Germany. (DÜSSELDORF.)
Aktiebolaget Bofors-Gullspång, Bofors, Sweden (*Melting Furnaces and Foundry* at Bofors). (GOTHENBURG.)
Althaus, Pletsch & Co., Attendorn, Westphalia. (*Rolling Mills.*) (DÜSSELDORF.)
Annener Gussstahlwerk, Annen, Westphalia. (*Steel castings.*) (DÜSSELDORF.)
Avesta Jernverks Aktiebolag, Avesta, Sweden. (STOCKHOLM.)
Bergische Stahl-Industrie, Remscheid, Germany. (*Steel ingots and castings.*) (DÜSSELDORF.)

Bethlehem Steel Co., South Bethlehem, Philadelphia. (PHILADELPHIA.)

Björneborgs Jernverks Aktiebolag, Björneborg, Sweden. (*Melting Furnaces and Forge.*) (GOTHENBURG.)

Blechwalzwerk Schulz-Knaudt, Essen. (*Rolling Mills.*) (DÜSSELDORF.)

Bleckmann, John E., Mürzzuschlag, Austria. (*Steel bars.*) (TRIESTE.)

Bochumer Verein für Bergbau & Gussstahlfabrication, Bochum. (*Steel castings.*) (DÜSSELDORF.)

Borsig, A. (Berg und Hütten-Verwaltung), Borsigwerk, Oberschlesien. (*Also Steel castings.*) (DÜSSELDORF.)

Cambria Steel Co., Johnstown, Pa., U.S.A. (PITTSBURG.)

Carbon Steel Co., Pittsburg, Pa., U.S.A. (PITTSBURG.)

Carnegie Steel Co. (Lim.), Pittsburg, Pa., U.S.A. (including the National Steel Co., and the American Steel Hoop Co.) (PITTSBURG.)

Central Iron & Steel Co., Harrisburg, Pa., U.S.A. (*Rolling Mills.*) (PHILADELPHIA.)

Compagnie Anonyme des Forges de Chatillon & Commentry, Commentry, France. (MARSEILLES.)

Compagnie des Hauts-Fourneaux, Forges et Aciéries de la Marine et d'Homecourt, St. Chamond, France. (MARSEILLES.)

Compagnie Métallurgique Lilloise, Lesquin-lez-Lille (Nord), France. (*Steel Castings.*) (DUNKIRK.)

Deutsch-Oesterreichische Mannesmann Röhren Werke, Düsseldorf. (*Weldless rolled or drawn steel hollow pillars and davits.*) (DÜSSELDORF.)

Donawitz Iron & Steel Works, near Leoben. (TRIESTE.)

Dorémieux Fils & Cie., St. Amand (Nord), France. (*Rolling Mills.*) (DUNKIRK.)

Düsseldorfer Eisen-und Draht-Industrie, Düsseldorf-Oberbilk. (DÜSSELDORF.)

Düsseldorfer Röhren & Eisen-Walzwerke, Düsseldorf-Oberbilk. (DÜSSELDORF.)

Eisen und Stahlwerk Hoesch, Dortmund. (DÜSSELDORF.)

Eisenbahn-Bedarfs Actien Gesellschaft, Friedenshütte-Oberschlesien, Germany. (DÜSSELDORF.)

Fabrique de Fer de Maubeuge, Louvroil (Nord), France. (DUNKIRK.)

Ferriera di Bolzaneto, near Genoa. (*For plates up to $\frac{3}{4}$ in. thickness.*) (GENOA.)

Fonderia Milanese di Acciaio, Milan. (*Steel castings.*) (GENOA.)

Fonderies, Forges et Aciéries de St. Etienne, St. Etienne, France. (MARSEILLES.)

Forges & Laminoirs de l'Alliance, Marchienne au Pont, Belgium. (*Rolling Mills.*) (DÜSSELDORF.)

Forges de Clabecq, Clabecq, Belgium. (*Rolling Mills.*) (DÜSSELDORF.)

Forges de la Loire et du Midi (Messrs. Marrel Frères), Rive de Gier, France. (MARSEILLES.)

Ganz & Co., Ratibor, Silesia. (*Steel castings.*) (DÜSSELDORF.)

Geisweider Eisenwerke Actien Gesellschaft, Geisweid (Kreis Siegen), Germany. (DÜSSELDORF.)

Gelsenkirchener Gussstahl und Eisenwerke, vormals Munscheid & Co., Gelsenkirchen, Germany. (*Steel Castings.*) (DÜSSELDORF.)

Georgs-Marien-Bergwerks und Hütten-Verein, Osnabrück, Hanover. (*Steel Castings.*) (DÜSSELDORF.)

Gewerkschaft Deutscher Kaiser, Hamborn-Bruckhausen am Rhein, Germany. (DÜSSELDORF.)

Gewerkschaft Grillo, Funke & Co., Gelsenkirchen Schalke, Westfalen. (DÜSSELDORF.)

Gräfenberger Walzwerk, Düsseldorf-Grafenberg. (*Rolling Mills.*) (DÜSSELDORF.)

Gruson (Otto) & Co., Magdeburg-Buckau, Germany. (*Steel castings.*) (DÜSSELDORF.)

Gutehoffnungshütte, Oberhausen, Rheinland, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Haniel & Lueg, Düsseldorf-Grafenberg. (*Steel castings.*) (DÜSSELDORF.)

Hauts-Fourneaux, Fonderies Forges & Laminoirs de Meurthe & Moselle (Mr. Fould-Dupont), Usines de Pompey, France. (DÜSSELDORF.)

Henschel & Sohn, Abteilung Henrichshütte, near Hattingen a/d Ruhr. (DÜSSELDORF.)

Hoerder Bergwerks & Hütten-Verein, Hoerde, Westfalen, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Howaldtswerke, Kiel. (*Steel castings.*) (HAMBURG.)

Illinois Steel Co., Chicago, U.S.A. (CHICAGO.)

Jones & Laughlin (Lim.), Pittsburg, Pa., U.S.A. (PITTSBURG.)

Kolsva Jernverks Aktiebolag. (*Melting Furnaces and Foundry* at Kolsva, Sweden.) (STOCKHOLM.)

Krainische Industrie Gesellschaft, Assling, Oberkrain. (TRIESTE.)

Krupp, Fried., Actien Gesellschaft, Stahlwerk Annen, Annen, Westfalen, Germany. (*Steel castings.*) (DÜSSELDORF.)

Krupp, Friedr., Actien Gesellschaft, Essen, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Krupp, Friedr., Actien Gesellschaft, Grusonwerk, Magdeburg, Germany. (*Steel castings.*) (DÜSSELDORF.)

Luken's Iron and Steel Company, Coatesville, Pennsylvania, U.S.A. (PHILADELPHIA.)

Luxemburger-Bergwerks und Saarbrücker Eisenhütten-Actien-Gesellschaft, Burbach, near Saarbrücken, Germany. (DÜSSELDORF.)

Magyar Kiralyi Allamvasutak Gepgyaranak (*Rolling Mills* at Zolyom-Brezo; *Rolling Mills and Steel Foundry* at Diosgyor, Hungary.) (FIUME.)

Motala Verkstads Nya Aktiebolag, Motala Verkstad, Sweden. (*Melting Furnaces, Rolling Mills and Forge.*) (GOTHENBURG.)

Neuberg Steel Works, Neuberg, Styria. (TRIESTE.)

Nicopol-Marioopol Mining & Metallurgical Co., Sartana, South Russia. (ODESSA.)

Oberbilker Stahlwerk Actien Gesellschaft, Düsseldorf-Oberbilk. (DÜSSELDORF.)

Oberschlesische Eisen-Industrie Actien-Gesellschaft, Baildonhütte, near Kattowitz. (DÜSSELDORF.)

Oeking & Co., Düsseldorf-Lierenfeld. (*Steel castings.*) (DÜSSELDORF.)

Oesterreichisch-Alpine Montangesellschaft, Zeltweg, Austria. (TRIESTE.)

Oliver Iron & Steel Co., Pittsburg, Pa., U.S.A. (*Rolling Mills for bars.*) (PITTSBURG.)

Pennsylvania Steel Co., Steelton, near Harrisburg, Pa. (PHILADELPHIA.)

"Phoenix" Actien Gesellschaft, Eschweiler & Ruhrort, Germany. (DÜSSELDORF.)

Phœnix Iron Works, Phœnixville, Pa., U.S.A. (PHILADELPHIA.)

Pittsburg Steel Foundry, Glassport, Pa., U.S.A. (*Castings and Ingots.*) (PITTSBURG.)

Poldihütte Tiegelgussstahlfabrik, Kladno, near Prague. (DÜSSELDORF.)

Prager Eisen Industrie Gesellschaft und Böhmische Montan Gesellschaft, Kladno, near Prague. (DÜSSELDORF.)

Press und Walzwerk Actien-Gesellschaft, Düsseldorf-Reisholz. (DÜSSELDORF.)

Rheinische Bergbau und Hüttenwesen Actien Gesellschaft, Abteilung Oberbilker Blechwalzwerk, Düsseldorf-Oberbilk. (*Rolling Mills.*) (DÜSSELDORF.)

Rheinische Stahlwerke, Ruhrort, Germany. (DÜSSELDORF.)

Rheinische Stahlwerke, Abteilung Duisburger Eisen und Stahlwerke, Duisburg. (DÜSSELDORF.)

Rimamurany-Salgo-Tarjaner Eisenwerks Actien-Gesellschaft, Budapest. (*Steel Works* in Ozd, Hungary). (FIUME.)

Rombacher Hüttenwerke, Rombach (Lothringen). (*Bars and Sections only.*)

Saarbrücker Gussstahlwerke, Malstatt-Burbach, Germany. (*Steel castings.*) (DÜSSELDORF.)

Schichau, F., Elbing, West Prussia. (*Steel castings.*) (DÜSSELDORF.)

Schneider & Co., Creusot. (MARSEILLES.)

Skodawerke-Actien Gesellschaft, Pilsen, Bohemia. (*Steel castings.*) (DÜSSELDORF.)

Sociedad Altos Hornos de Vizcaya, Bilbao. (BILBAO.)

Sociedad Metalurgica Duro-Felguera, La Felguera, Austurias, Spain. (BILBAO.)

Società degli Alti Forni, Fonderie ed Acciaierie di Terni. Works at Terni. (NAPLES.)

Società Ligure Metallurgica (Lim.), Sestri Ponente, Italy. (GENOA.)

Società Siderurgica di Savona (late Tardy & Benech), Savona. (GENOA.)

Société Anonyme Boulonneries & Laminoirs Gilson, La Croyère (Bois d'Haine), Belgium. (*Rolling Mills for Sections.*) (DÜSSELDORF.)

Société Anonyme d'Escaut & Meuse, Anzin (Nord), France. (DUNKIRK.)

Société Anonyme d'Espérance, Longdoz, Liége. (*Rolling Mills.*) (DÜSSELDORF.)

Société Anonyme des Aciéries & Fonderies d'Art, Haine St. Pierre, Belgium. (*Steel castings.*) (DÜSSELDORF.)

Société Anonyme de la Fabrique de Fer de Charleroi, Belgium. (*Rolling Mills.*) (DÜSSELDORF.)

Société Anonyme des Fonderies et Aciéries de Hirson, Hirson, France. (*Steel castings.*) (HAVRE.)

Société Anonyme de Marcinelle & Couillet, Couillet, Belgium. (DÜSSELDORF.)

Société Anonyme des Aciéries d'Angleur, Renory & Tilleur-lez-Liége, Belgium. (DÜSSELDORF.)

Société Anonyme des Aciéries Nantaises, Nantes. (*Steel Castings.*) (NANTES.)

Société Anonyme des Forges et Fonderies de Montataire, Montataire, France. (HAVRE.)

Société Anonyme des Hauts-Fourneaux, Fonderies & Forges de Franche-Comté, Fraisans (Jura), France. (MARSEILLES.)

Société Anonyme des Hauts-Fourneaux Forges et Aciéries de Denain & d'Anzin, Denain (Nord), France. (DUNKIRK.)

Société Anonyme d'Ougrée-Marihaye, near Liége. (DÜSSELDORF.)

Société Anonyme des Forges de la Providence, Hautmont (Nord), France. (DUNKIRK.)

Société Anonyme des Forges et Tôleries Liégeoises, Jupille-lez-Liége. (DÜSSELDORF.)

Société Anonyme Usines & Aciéries Leonard-Giot, Marchienne-au-Pont, Belgium. (*Steel castings.*) DÜSSELDORF.)

Société des Aciéries de Longwy, Mont St. Martin (Meurthe & Moselle). (DÜSSELDORF.)

Société Anonyme des Tôleries de Louvroil, (Nord) France. (DUNKIRK.)

Société Anonyme des Usines du Phénix, Châtelineau, Belgium. (*Rolling Mills.*) (DÜSSELDORF.)

Société John Cockerill, Seraing, near Liége. (DÜSSELDORF.)

Stahl und Walzwerk Rendsburg, Aktiengesellschaft, Rendsburg. (HAMBURG.)

Stahlwerk Krieger, Actien Geselschaft, Düsseldorf. (*Steel castings.*) (DÜSSELDORF.)

Stora Kopparbergs Bergslags Aktiebolag., Falun. Sweden. (*Steel Works* at Domnarfvet.) (*Sections of all sizes and plates up to* $\frac{3}{4}$ *in. thick.*) (STOCKHOLM.)

Strömmens Verksted, near Christiania. (*Steel castings.*) (CHRISTIANIA.)

Strömsnäs Jernverks Aktiebolag, Degerfors, Sweden. (*Melting Furnaces and Rolling Mills.*) (GOTHENBURG.)

Ternitzer Stahl und Eisenwerk, Ternitz, Austria. (*Steel bars and castings.*) (TRIESTE.)

Thyssen & Co., Mülheim, a/d. Ruhr, Germany. (DÜSSELDORF.)

Tidewater Steel Company, Chester, Pennsylvania, U.S.A. (PHILADELPHIA.)

UngarischeBerg-und Hüttenwerke und Domänen der priv. österr.-ung. Staats-Eisenbahn-Gesellschaft, Budapest. (*Steel Works* in Resicza.) (FIUME.)

Union Actien Gesellschaft für Eisen & Stahlindustrie, Dortmund, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Usines de Court St. Etienne (Emile Henricot), Belgium. (*Steel castings.*) (DÜSSELDORF.)

Wendel & Cie., les Petits-Fils de F^ois^ de, Hayingen, Lothringen. (DÜSSELDORF.)

Westfälische Stahlwerke, Bochum. (*Steel castings.*) (DÜSSELDORF.)

Witkowitzer Bergbau & Eisenhütten Gewerkschaft, Witkowitz, Mähren. (DÜSSELDORF.)

Worth Bros. Steel Works, Coatesville, Pa. (PHILADELPHIA.)

FOREIGN FIRMS.

ARRANGED ACCORDING TO SURVEYING DISTRICTS.

BILBAO.

Sociedad Altos Hornos de Vizcaya, Bilbao.
Sociedad Metalurgica Duro-Felguera, La Felguera, Asturias, Spain.

CHICAGO.

Illinois Steel Co., Chicago, U.S.A.

CHRISTIANIA.

Strömmens Verksted, near Christiania. (*Steel castings.*)

DUNKIRK.

Compagnie Métallurgique Lilloise, Lesquin-lez-Lille (Nord), France. (*Steel Castings.*)

Dorémieux Fils & Cie., St. Amand (Nord), France. (*Rolling Mills.*)

Fabrique de Fer de Maubeuge, Louvroil (Nord), France.

Société Anonyme d'Escaut & Meuse, Anzin (Nord), France.

Société Anonyme des Hauts-Fourneaux Forges et Aciéries de Denain & d'Anzin, Denain, (Nord), France.

Société Anonyme des Forges de la Providence, Hautmont (Nord), France.

Société Anonyme des Tôleries de Louvroil, (Nord) France.

DÜSSELDORF.

Aachener Hütten Actien Verein Rothe Erde, Aachen, Germany.

Aciéries de la Louvière (Gustave Boël), La Louvière, Belgium. (*Sections and Rivet Bars, and Steel Castings.*)

Actien-Gesellschaft Charlottenhütte, Niederschelden (Kreis Siegen), Germany. (*Steel plates and ingots.*)

Actien-Gesellschaft der Dillinger Hüttenwerke, Dillingen-Saar (Rheinpreussen), Germany.

Althaus, Pletsch & Co., Attendorn, Westphalia. (*Rolling Mills.*)

Annener Guss stahlwerk, Annen, Westphalia. (*Steel castings.*)

Bergische Stahl-Industrie, Remscheid, Germany. (*Steel ingots and castings.*)

Blechwalzwerk Schulz-Knaudt, Essen. (*Rolling Mills.*)

Bochumer Verein für Bergbau & Guss stahlfabrication, Bochum. (*Steel castings.*)

Borsig, A. (Berg und Hütten-Verwaltung), Borsigwerk, Oberschlesien. (*Also Steel castings.*)

Deutsch-Oesterreichische Mannesmann Röhren Werke, Düsseldorf (*weldless rolled or drawn steel hollow pillars and davits*).

Düsseldorfer Eisen-und Draht-Industrie, Düsseldorf-Oberbilk.

Düsseldorfer Röhren & Eisen-Walzwerke, Düsseldorf-Oberbilk.

Eisen und Stahlwerk Hoesch, Dortmund.

Eisenbahn-Bedarfs Actien Gesellschaft, Friedenshütte-Oberschlesien, Germany.

Forges & Laminoirs de l'Alliance, Marchienne au Pont, Belgium. (*Rolling Mills.*)

Forges de Clabecq, Brussels, Belgium. (*Rolling Mills.*)

Ganz & Co., Ratibor, Silesia. (*Steel castings.*)

Geisweider Eisenwerke Actien Gesellschaft, Geisweid (Kreis Siegen), Germany.

Gelsenkirchener Guss stahl und Eisenwerke, vormals Munschied & Co., Gelsenkirchen, Germany. (*Steel castings.*) (DÜSSELDORF.)

Georgs-Marien-Bergwerks und Hütten-Verein, Osnabrück, Hanover. (*Steel castings.*) (DÜSSELDORF.)

Gewerkschaft Deutscher Kaiser, Hamborn-Bruckhausen am Rhein, Germany.

DÜSSELDORF—*continued.*

Gewerkschaft Grillo, Funke & Co., Gelsenkirchen-Schalke, Westfalen.

Grafenberger Walzwerk Düsseldorf-Grafenberg. (*Rolling Mills.*)

Gruson (Otto) & Co., Magdeburg-Buckau, Germany. (*Steel castings.*)

Gutehoffnungshütte, Oberhausen, Rheinland, Germany. (*Also Steel castings.*)

Haniel & Lueg, Düsseldorf-Grafenburg. (*Steel castings.*)

Hauts-Fourneaux, Fonderies Forges & Laminoirs de Meurthe & Moselle (Mr. Fould-Dupont), Usines de Pompey, France.

Henschel & Sohn, Abteilung Henrichshütte, near Hattingen a/d. Ruhr.

Hoerder Bergwerks & Hütten-Verein, Hoerde Westfalen, Germany. (*Also Steel castings.*)

Krupp, Fried., Actien Gesellschaft, Stahlwerk Annen, Annen, Westfalen, Germany. (*Steel castings.*)

Krupp, Friedr., Actien Gesellschaft, Essen, Germany. (*Also Steel castings.*)

Krupp, Fried., Actien Gesellschaft, Grusonwerk, Magdeburg, Germany. (*Steel castings.*)

Luxemburger-Bergwerks und Saarbrücker Eisenhütten-Actien-Gesellschaft, Burbach, near Saarbrücken, Germany.

Oberbilker Stahlwerk Actien Gesellschaft, Düsseldorf-Oberbilk.

Oberschlesische Eisen-Industrie Actien-Gesellschaft, Baildonhütte, near Kattowitz.

Oeking & Co., Düsseldorf-Lierenfeld. (*Steel castings.*)

"Phoenix" Actien Gesellschaft, Eschweiler & Ruhrort, Germany.

Poldihütte Tiegelgussstahlfabrik, Kladno, near Prague.

Prager Eisen Industrie Gesellschaft und Böhmische Montan Gesellschaft, Kladno, near Prague.

Press und Walzwerk Actien-Gesellschaft, Düsseldorf-Reisholz.

Rheinische Bergbau und Hüttenwesen Actien Gesellschaft, Abteilung Oberbilker Blechwalzwerk, Düsseldorf-Oberbilk. (*Rolling Mills.*)

Rheinische Stahlwerke, Ruhrort, Germany.

Rheinische Stahlwerke, Abteilung Duisburger Eisen und Stahlwerke, Duisburg.

Rombacher Hüttenwerke, Rombach (Lothringen). (*Bars and Sections only.*)

Saarbrücker Gusstahlwerke, Malstatt-Burbach, Germany. (*Steel castings.*)

DÜSSELDORF—*continued.*

Schichau, F., Elbing, West Prussia. (*Steel castings.*)

Skodawerke Actien Gesellschaft, Pilsen, Bohemia. (*Steel castings.*)

Société Anonyme Boulonneries & Laminoirs Gilson, La Croyère (Bois d'Haine), Belgium. (*Rolling Mills for Sections.*)

Société Anonyme d'Espérance, Longdoz, Liége.

Société Anonyme de la Fabrique de Fer de Charleroi, Belgium. (*Rolling Mills.*)

Société Anonyme de Marcinelle & Couillet, Couillet, Belgium.

Société Anonyme des Acieries & Fonderies d'Art, Haine St. Pierre, Belgium. (*Steel castings.*)

Société Anonyme des Aciéries d'Angleur, Renory & Tilleur-lez-Liège, Belgium.

Société Anonyme des Forges et Tôleries Liégeoises, Jupille-lez-Liége, Belgium.

Société Anonyme d'Ougrée-Marihaye, near Liége.

Société Anonyme des Usines du Phénix, Châtelineau, Belgium. (*Rolling Mills.*)

Société Anonyme Usines & Acieries Leonard-Giot, Marchienne-au-Pont, Belgium. (*Steel castings.*)

Société John Cockerill, Seraing, near Liége.

Société des Aciéries de Longwy, Mont St. Martin (Meurthe & Moselle).

Stahlwerk Krieger, Actien Gesellschaft, DÜSSELDORF. (*Steel castings.*)

Thyssen & Co., Mülheim, a.d. Ruhr, Germany.

Union Actien Gesellschaft für Eisen & Stahlindustrie, Dortmund, Germany. (*Also Steel castings.*)

Usines de Court St. Etienne (Emile Henricot), Belgium. (*Steel castings.*)

Wendel & Cie., les Petits-Fils de F[ois] de, Hayingen, Lothringen.

Westfälische Stahlwerke, Bochum, Westfalen. (*Steel castings.*)

Witkowitzer Bergbau & Eisenhütten Gewerkschaft, Witkowitz, Mähren.

FIUME.

Magyar Kiralyi Allamvasutak Gepgyaranak (*Rolling Mills* at Zolyom-Brezo; *Rolling Mills and Steel Foundry* at Diosgyör, Hungary.)

Rimamurany - Salgo - Tarjaner Eisenwerks Actien-Gesellschaft, Budapest. (*Steel Works* in Ozd, Hungary.)

FIUME—*continued.*

Ungarische Berg-und Hüttenwerke und Domänen per priv. österr.-ung. Staats-Eisenbahn - Gesellschaft, Budapest. (*Steel Works* in Resicza.)

GENOA.

Acciaierie Italiane, Bolzaneto, Italy.

Ferriera di Bolzaneto, near Genoa. (*For plates up to* $\frac{3}{4}$ *in. thickness.*)

Fonderia Milanese di Acciaio, Milan. (*Steel castings.*)

Società Ligure Metallurgica (Lim.), Sestri Ponente, Italy.

Società Siderurgica di Savona (late Tardy & Benech), Savona.

GOTHENBURG.

Aktiebolaget Bofors-Gullspång, Bofors, Sweden. (*Melting Furnaces and Foundry* at Bofors.)

Björneborgs Jernverks Aktiebolag, Björneborg, Sweden. (*Melting Furnaces and Forge.*)

Strömsnäs Jernverks Aktiebolag, Degerfors, Sweden. (*Melting Furnaces and Rolling Mills.*)

Motala Verkstads Nya Aktiebolag, Motala Verkstad, Sweden. (*Melting Furnaces, Rolling Mills and Forge.*)

HAMBURG.

Howaldtswerke, Kiel. (*Steel castings*).

Stahl und Walzwerk Rendsburg, Aktiengesellschaft, Rendsburg.

HAVRE.

Aciéries de Grenelle (E. Plichon), 56, Rue Lourmel, Paris. (*Steel castings.*)

Aciéries de Maromme (E. Breton), Maromme (Seine Inférieure), France. (*Steel castings.*)

Société Anonyme des Fonderies et Acieries de Hirson, Hirson, France. (*Steel castings.*)

Société Anonyme des Forges et Fonderies de Montataire, Montataire, France.

MARSEILLES.

Compagnie Anonyme des Forges de Chatillon & Commentry, Commentry, France.

Compagnie des Hauts-Fourneaux, Forges et Aciéries de la Marine et d'Homecourt, St. Chamond, France.

Fonderies, Forges et Aciéries de St. Etienne, St. Etienne, France.

MARSEILLES—*continued.*

Forges de la Loire et du Midi (Messrs. Marrel Frères), Rive de Gier, France.

Schneider & Co., Creusot.

Société Anonyme des Hauts-Fourneaux, Fonderies & Forges de Franche-Comté, Fraisans (Jura), France.

NANTES.

Aciéries Hauts-Fourneaux & Forges de Trignac, near St. Nazaire.

Société Anonyme des Aciéries Nantaises, Nantes. (*Steel castings.*)

NAPLES.

Società degli Alti Forni, Fonderie ed Acciaierie di Terni. Works at Terni.

ODESSA.

Nicopol-Marioopol Mining & Metallurgical Co., Sartana, South Russia.

PHILADELPHIA.

Bethlehem Steel Co., South Bethlehem, Philadelphia.

Central Iron & Steel Co., Harrisburg, Pa. (*Rolling Mills.*)

Luken's Iron & Steel Company, Coatesville, Pennsylvania.

Pennsylvania Steel Co., Steelton, Harrisburg, Pa.

Phœnix Iron Works, Phœnixville, Pa.

PHILADELPHIA—*continued.*

Tidewater Steel Company, Chester, Pennsylvania.

Worth Bros. Steel Works, Coatesville, Pa.

PITTSBURG.

Cambria Steel Co., Johnstown, Pa.

Carbon Steel Co., Pittsburg, Pa., U.S.A.

Carnegie Steel Co. (Lim.), Pittsburg, Pa. (including the National Steel Co., and the American Steel Hoop Co.).

Jones & Laughlin (Lim.), Pittsburg, Pa.

Oliver Iron & Steel Co., Pittsburg, Pa., U.S.A.

Pittsburg Steel Foundry, Glassport, Pa., U.S.A. (*Castings and Ingots.*)

STOCKHOLM.

Avesta Jernverks Aktiebolag, Avesta, Sweden.

Kohlswa Jernverks Aktiebolag. (*Melting Furnaces and Foundry* at Kohlswa, Sweden.)

Stora Kopparbergs Bergslags Aktiebolag., Falun, Sweden. (*Steel Works* at Domnarfvet.) (*Sections of all sizes and plates up to* $\frac{3}{4}$ *ins. thick.*)

TRIESTE.

Bleckmann, John E., Mürzzuschlag, Austria. (*Steel bars.*)

Donawitz Iron & Steel Works, near Leoben.

Krainische Industrie Gesellschaft, of Assling, Oberkrain.

Neuberg Steel Works, Neuberg, Styria.

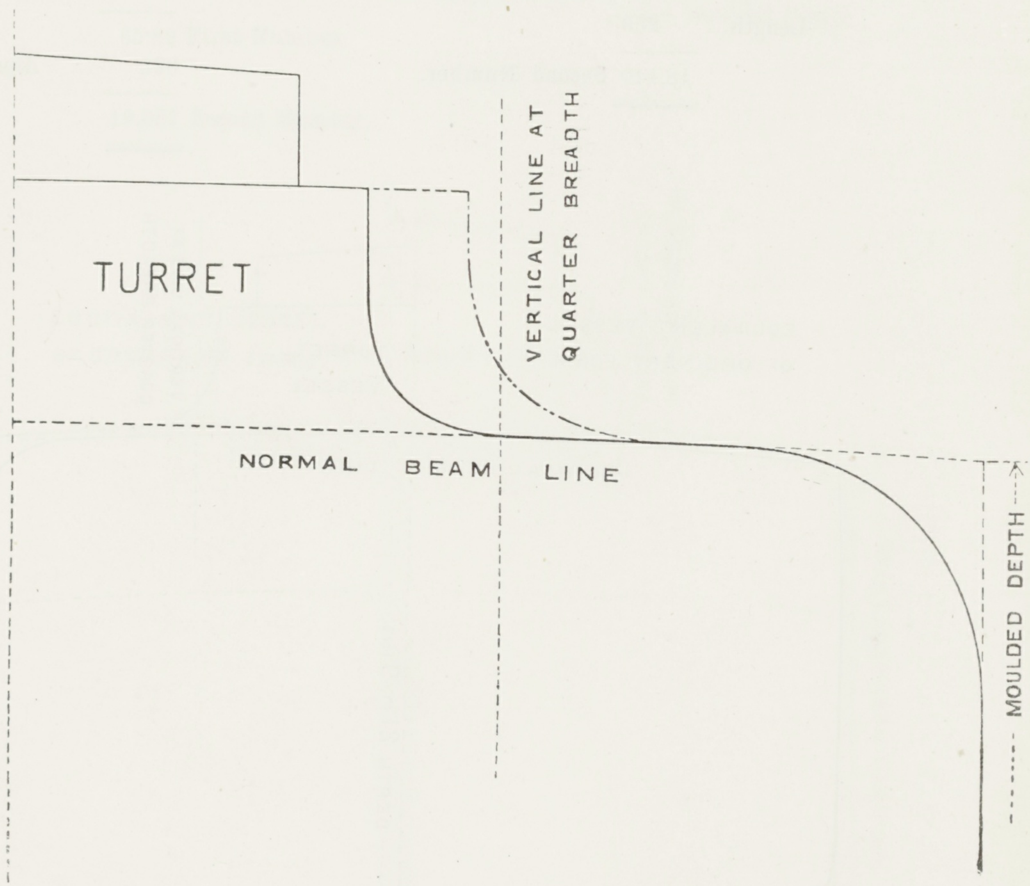
Oesterreichisch - Alpine Montangesellschaft, Zeltweg, Austria.

Ternitzer Stahl und Eisenwerk, Ternitz, Austria. (*Steel bars and castings.*)

(*Revised, May*, 1906.)

SKETCH A.

Sketch illustrating method of determining the depth of Turret deck Vessels.



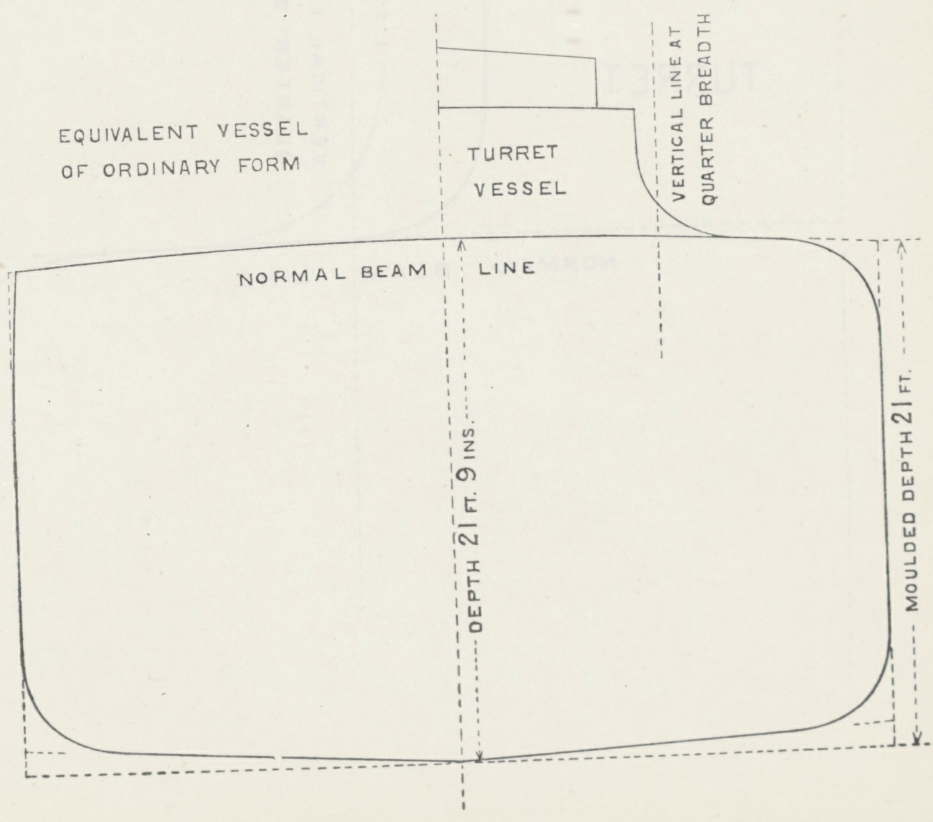
SKETCH SHOWING METHOD OF ESTIMATING THE

Dimensions.

Length (Rule)	250 ft. 0 ins.
Breadth (Moulded)	36 „ 0 „
Depth (Do.)	21 „ 0 „
Depth (Rule)	21 „ 9 „
Depth for proportions	24 „ $4\frac{1}{4}$ „

Proportions :—Length = 6·9 Breadths.
„ = 10·2 Depths.

	FT.	
Periphery of half Midship Section	=74·75	
Less ...	2·19	Three fourths Standard mean sheer for Length equal to 12 times Moulded Depth.
	72·56	**First Number.**
Length...	250	
	18,140	**Second Number.**



SKETCH B.

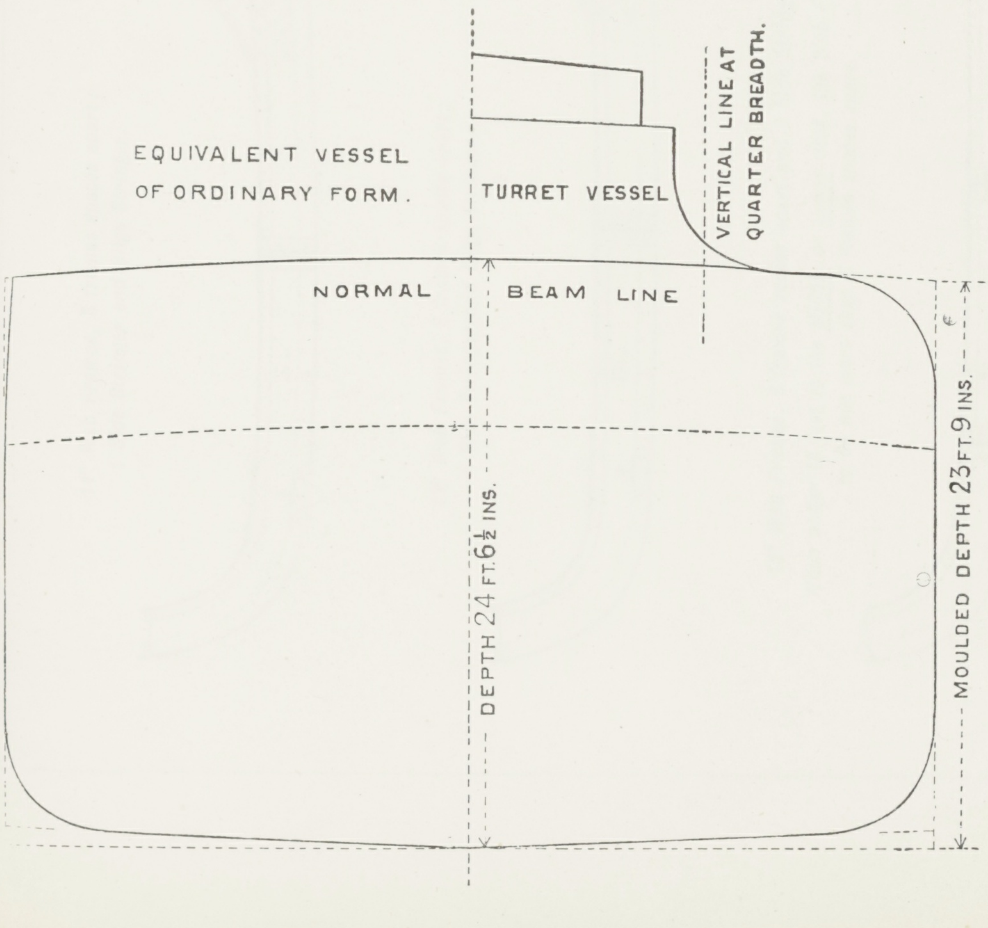
NTLING NUMERALS OF A TURRET DECK VESSEL.

Dimensions.

Length (Rule)	290 ft. 0 ins.	
Breadth (Moulded)	38 „ 6 „	
Depth (Do.)	23 „ 9 „	to Upper Deck.
Depth (Rule)	24 „ $6\frac{1}{2}$ „	
Depth for proportions... ...	27 „ $1\frac{1}{2}$ „	

	FT.	
Periphery of half Midship Section	=82·22	
Deduct	14·00	Vessel being more than 24 feet Rule depth.
	68·22	
Less ...	2·40	Three fourths Standard mean sheer for Length equal 12 [times Moulded Depth.
	65·82	**First Number.**
Length ...	290	
	19,087	**Second Number.**

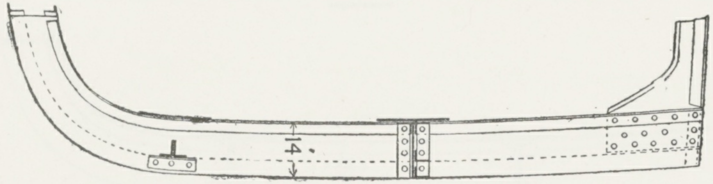
Proportions:—Length = 7·5 Breadths.
„ = 10·6 Depths.



Sketches illustrating the arrangement of WEB FRAMES and SIDE STRINGERS in lieu of HOLD BEAMS, as per Section 14a, paragraphs 9 to 19.

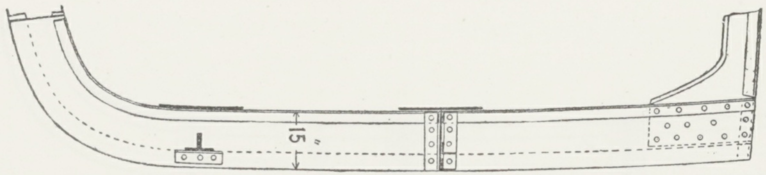
under 16 feet (par. 9).

14" Web Frames, 8 frames spaces apart;
1 Side Stringer and Bilge Stringer.



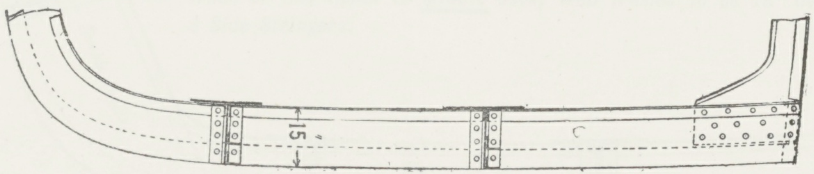
16 feet and under 17 feet (par. 10).

15" Web Frames, 8 frames spaces apart;
1 Side Stringer and Bilge Stringer.



17 feet and under 18 feet (par. 11).

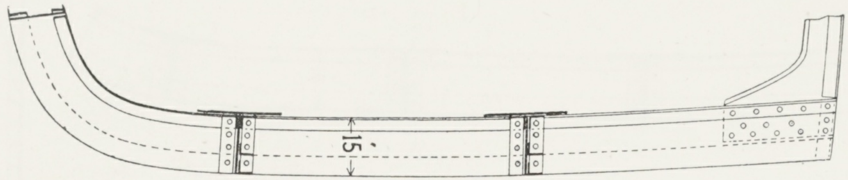
15" Web Frames, 8 frames spaces apart and 2 Side Stringers.
When under 18 feet to the Middle or Lower deck, the Web Frames to be not more than 6 frames spaces apart.



Web Frames and Side Stringers in lieu of Hold Beams—(continued).

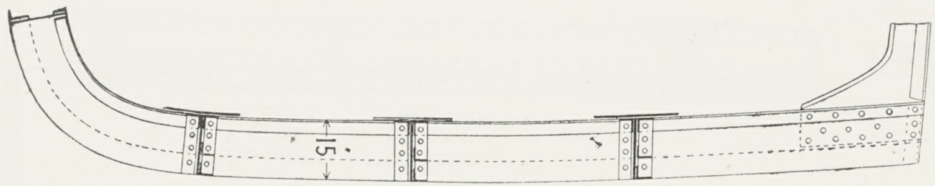
18 feet and under $21\frac{1}{2}$ feet (par 12).

15″ Web Frames, 6 frame spaces apart
and 2 Side Stringers.
When of this depth to Middle deck, Web frames to be 18″ deep.

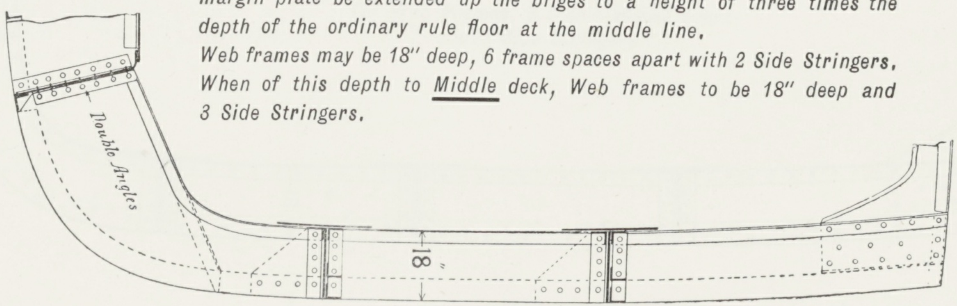


$21\frac{1}{2}$ feet and under $22\frac{1}{2}$ feet (par. 13).

15″ Web Frames, 6 frame spaces apart
and 3 Side Stringers.
When of this depth to Middle deck, Web frames to be 18″ deep and 3 Side Stringers.



Or, in Vessels fitted with double bottoms, provided the brackets outside the margin plate be extended up the bilges to a height of three times the depth of the ordinary rule floor at the middle line.
Web frames may be 18″ deep, 6 frame spaces apart with 2 Side Stringers.
When of this depth to Middle deck, Web frames to be 18″ deep and 3 Side Stringers.

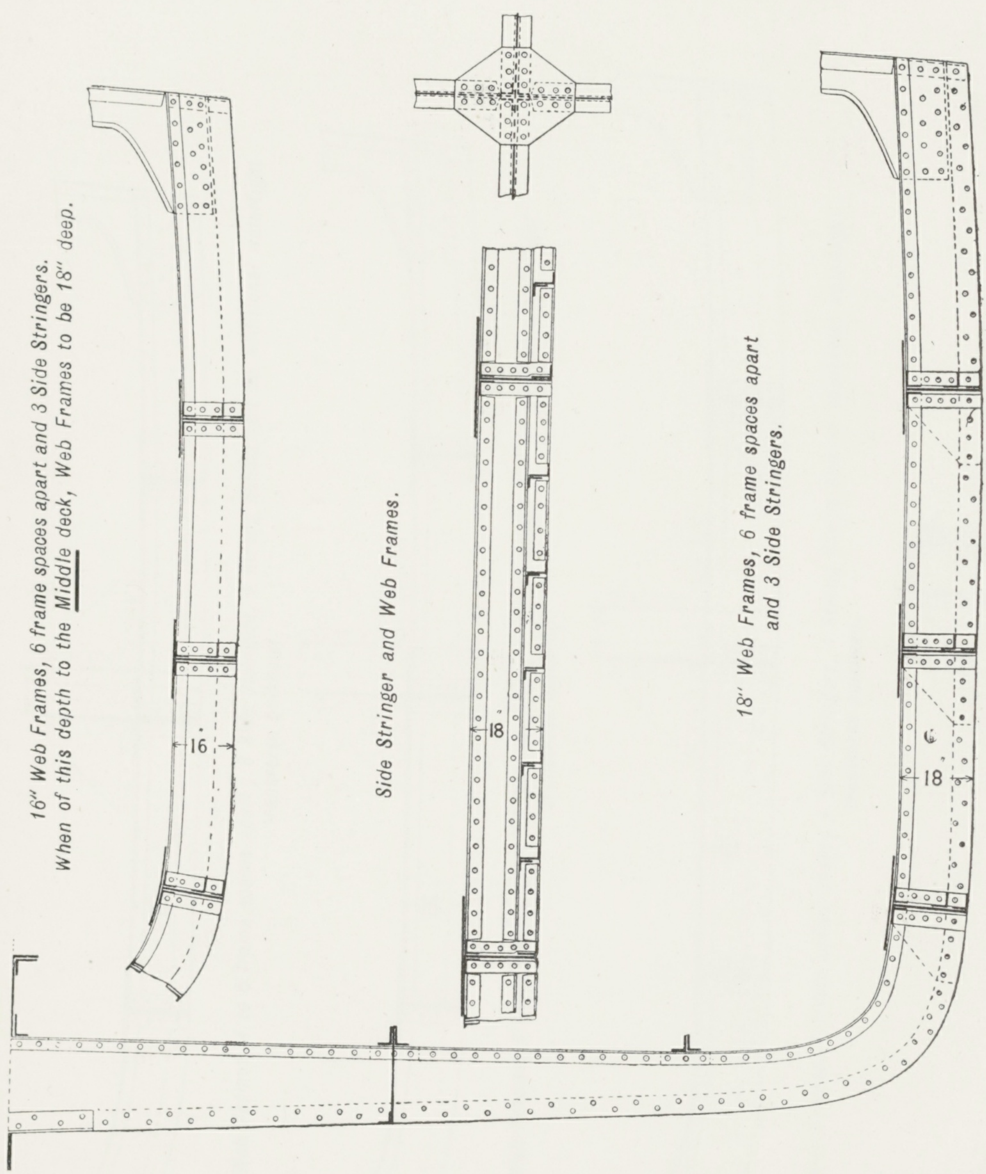


Web Frames and Side Stringers in lieu of Hold Beams—continued.

$22\frac{1}{2}$ feet and under $23\frac{1}{2}$ feet (par. 14).

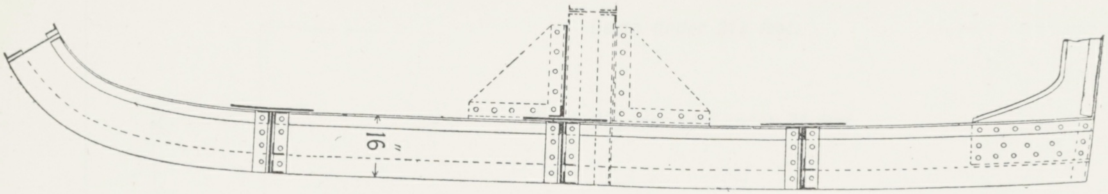
Diamond Plates.

$23\frac{1}{2}$ feet and under 24 feet (par. 15).



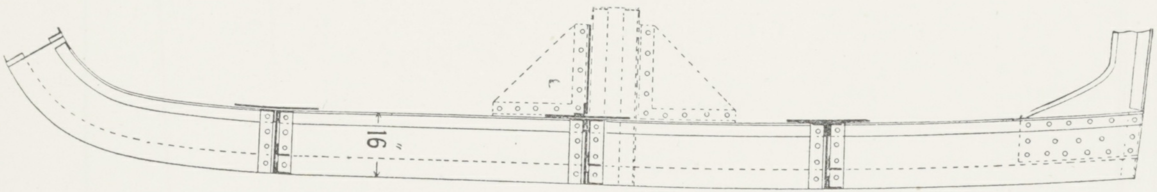
Web Frames in way of Raised Quarter Deck in lieu of lower deck beams and beams of extra strength wide spaced in lower hold. (See Section 14a, paragraphs 16 to 19.)

16″ Web Frames, 5 frame spaces apart; 3 Side Stringers, 4 Strong Beams and an additional watertight transverse bulkhead.



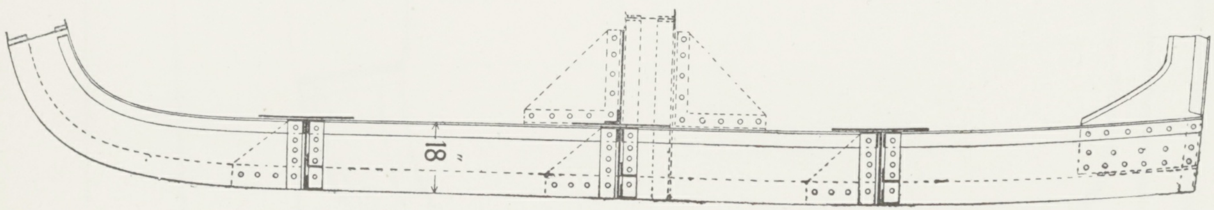
24 feet and under 25 feet (par. 16).

16″ Web Frames, 4 to 5 frame spaces apart; 3 Side Stringers, 4 Strong Beams and an additional watertight transverse bulkhead.



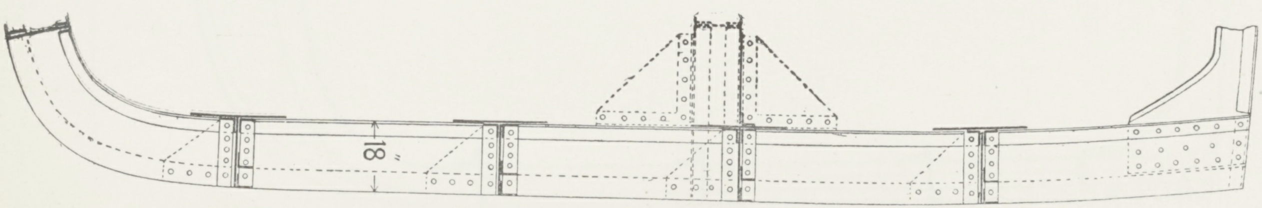
25 feet and under 26 feet (par. 17).

18″ Web Frames, 4 frame spaces apart; 3 Side Stringers, 4 Strong Beams and an additional watertight transverse bulkhead.



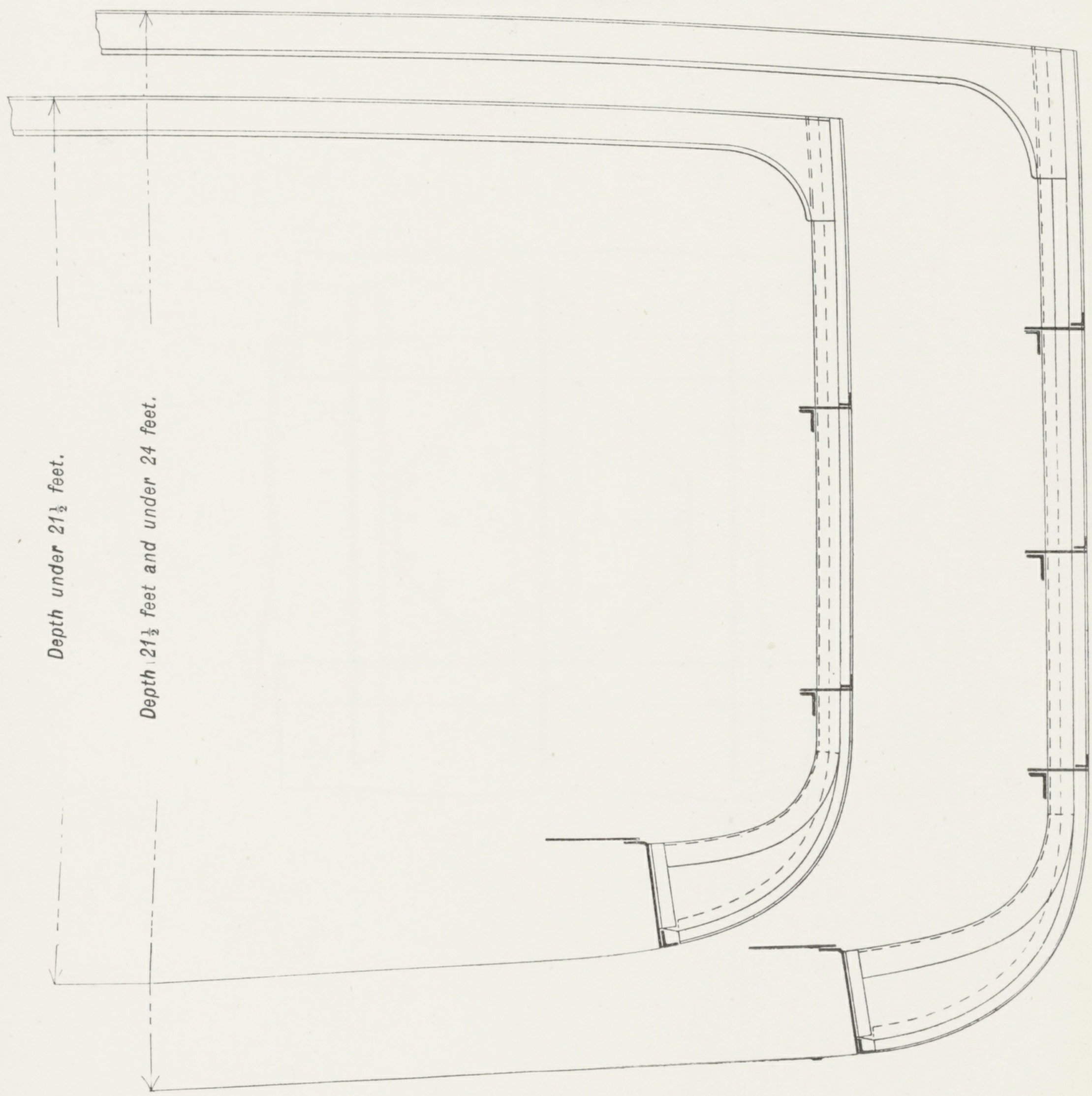
26 feet and under 27 feet (par. 18.)

18″ Web Frames, 4 frame spaces apart; 4 Side Stringers, 4 Strong Beams and an additional watertight transverse bulkhead.



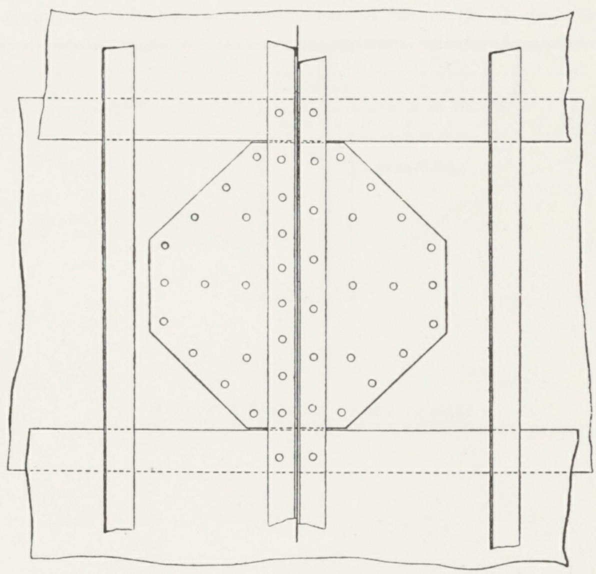
27 feet and under 28 feet. (par. 19).

Sketches illustrating the arrangement of SIDE STRINGERS and DEEP FRAMING in lieu of HOLD BEAMS (as per Section 14b).



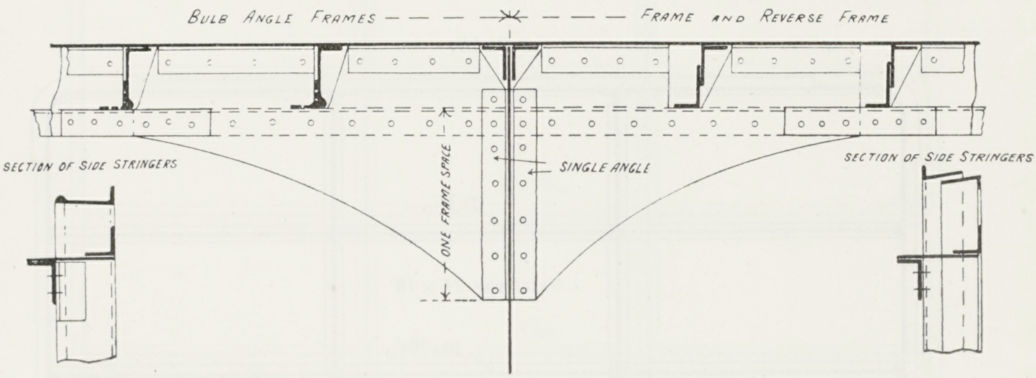
DIAMOND SHAPED BULKHEAD LINER.

See Section 22, paragraph 6.



SKETCH ILLUSTRATING THE CONNECTION OF SIDE STRINGERS TO WATERTIGHT BULKHEADS IN THE CASE OF VESSELS FITTED WITH DEEP FRAMING.

See Section 22, paragraph 6: also Section 14b, paragraph 6.

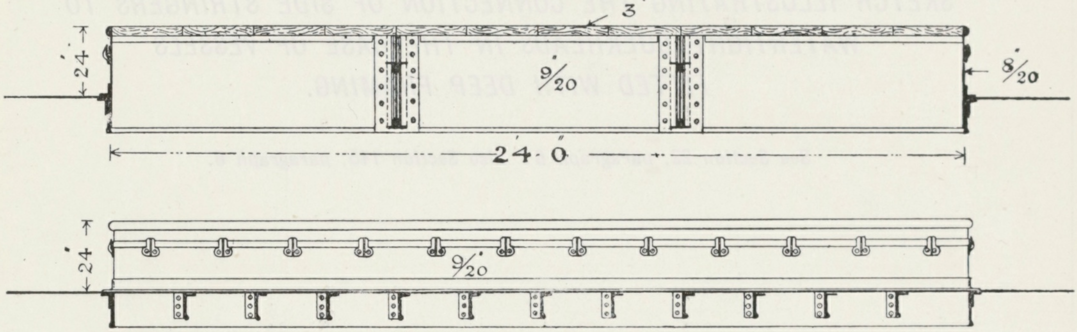


BRACKETS $\frac{1}{20}$ THICKER THAN FRAMES

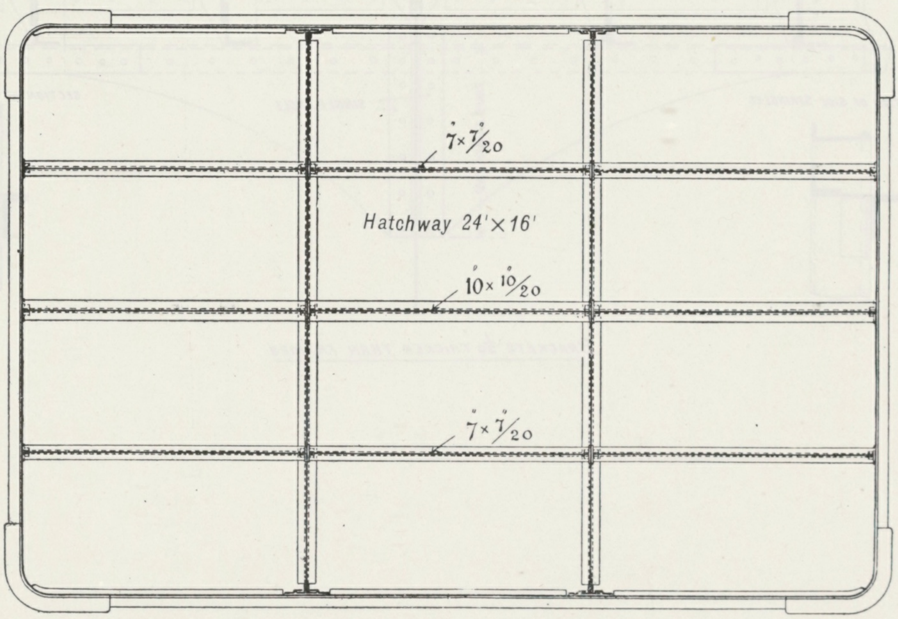
UPPER DECK HATCHWAY.

24′ 0″ × 16′ 0″

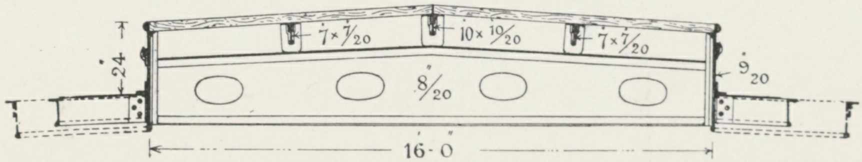
ELEVATIONS AT SIDE.



PLAN.



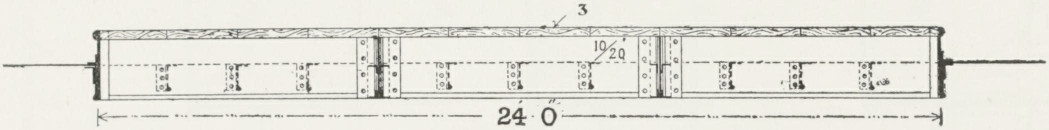
SECTIONAL ELEVATION AT WEB PLATE.



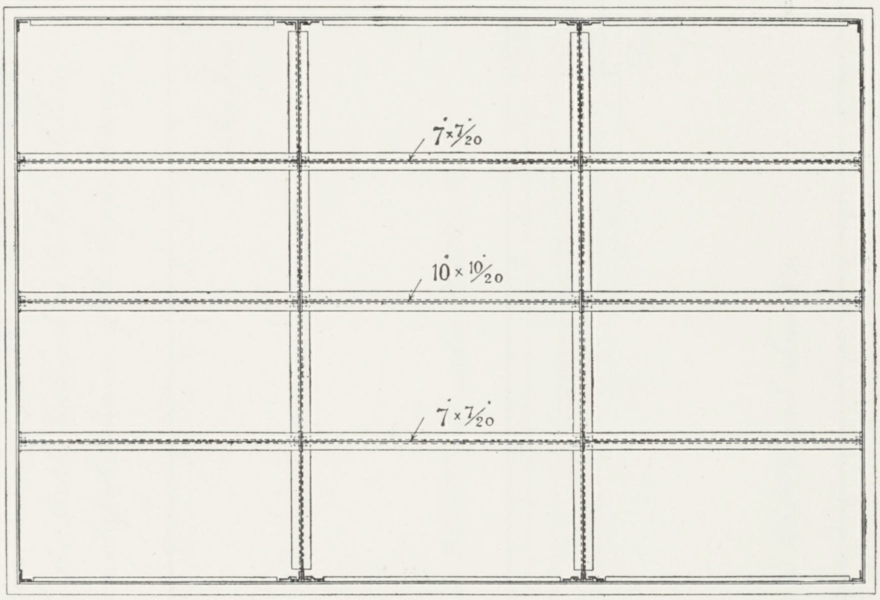
LOWER DECK HATCHWAY.

24′ 0″ × 16′ 0″

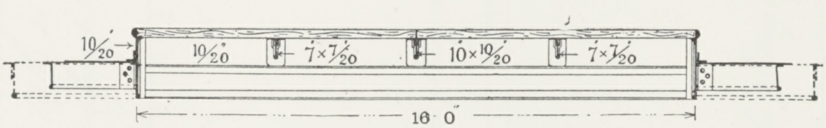
ELEVATION AT SIDE.



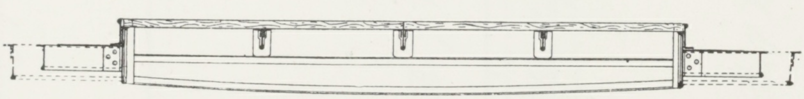
PLAN.



SECTIONAL ELEVATIONS AT WEB PLATE.

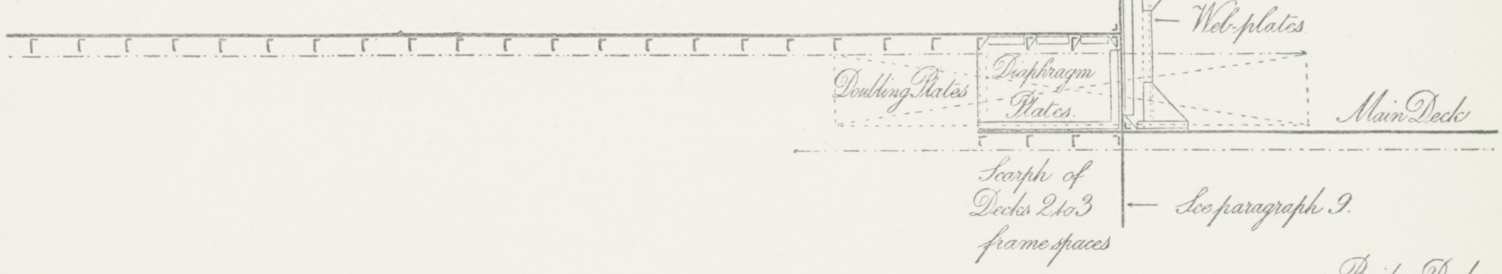


OR,

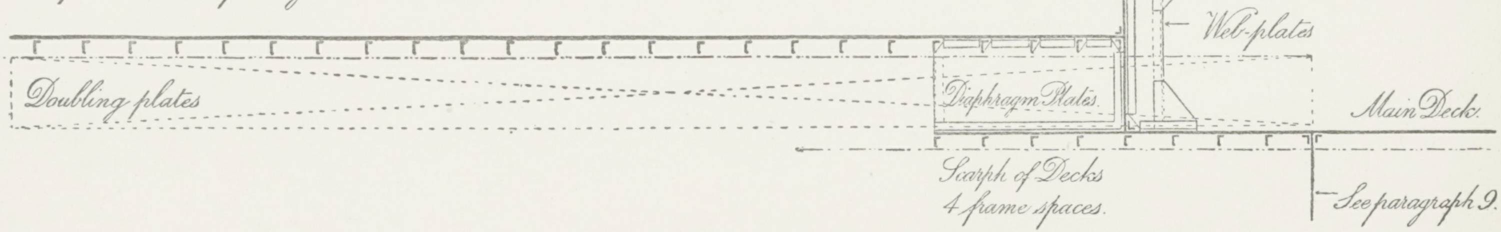


Section 45. Sketches shewing arrangements at Break of Raised Quarter Deck as per paragraphs 5.6.7.8 & 9.

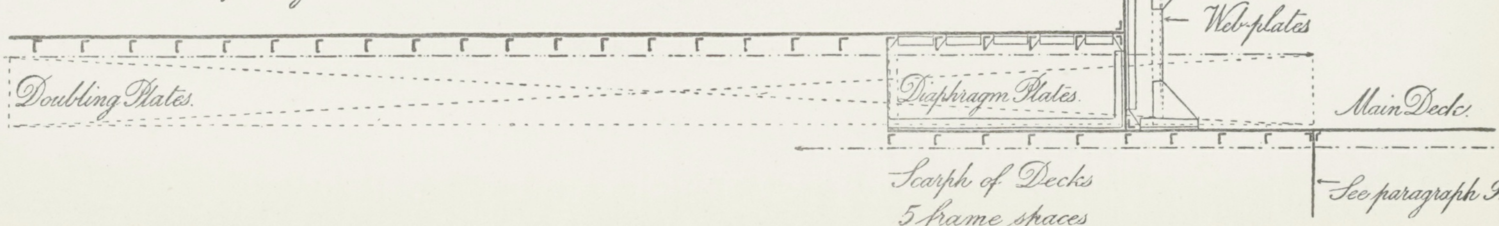
Paragraph 9. Where the plating number exceeds 20.000 or the Vessel is over 13 depths to length, the break bulkhead is to be not less than four frame spaces abaft the after end of the Engine opening.



Par. 7. Where the plating number is 24.000 and under 26.000. &c.

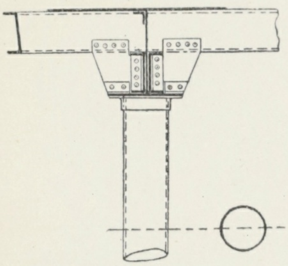


Par. 7 Where the plating number is 26.000 and above, &c.

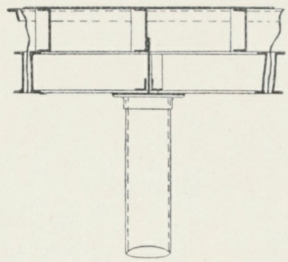


SKETCHES ILLUSTRATING SOME METHODS OF ATTACHI

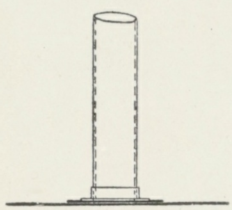
ATTACHMENT AT HEAD OF A TUBULAR PILLAR.

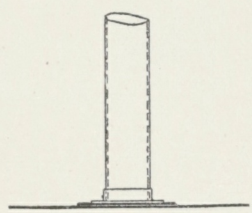


LONGITUDINAL PLAN.

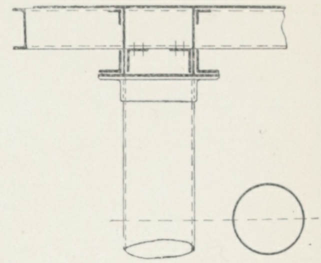


ATTACHMENT AT HEELS.

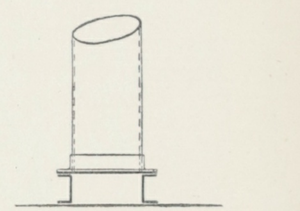




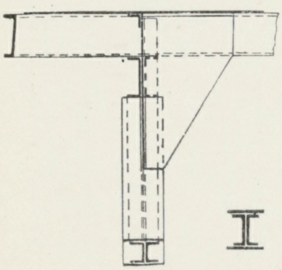
ATTACHMENT AT HEAD OF A TUBULAR PILLAR.



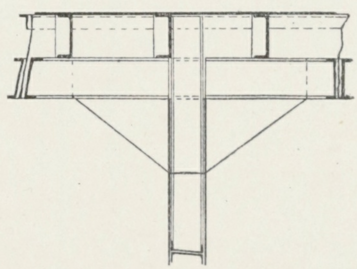
ATTACHMENT



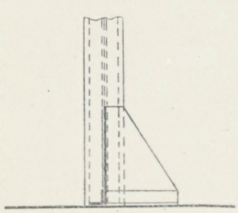
ATTACHMENT AT HEAD OF A PILLAR FORMED OF DOUBLE CHANNELS AND FACE PLATES.

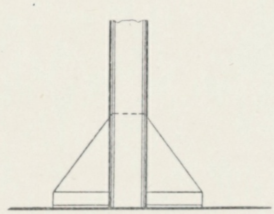


LONGITUDINAL PLAN.

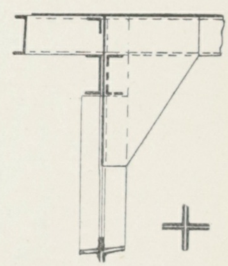


ATTACHMENT AT HEELS.

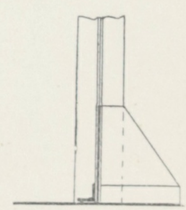




ATTACHMENT AT HEAD OF A PILLAR FORMED OF FOUR ANGLES.



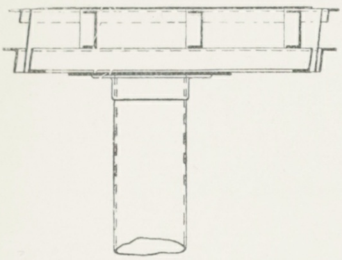
ATTACHMEN



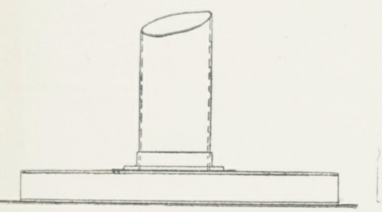
1. Pillars and girders of other form will be admitted provided the same are of equivalent strength to th
2. Where no seating is fitted, wide spaced hold pillars are to be stepped when practicable at an interse fitted on each side of the floors beneath the pillars.
3. For Scantlings of wide spaced Pillars, and Girders at heads of same, *see* Tables S 1c and S 1d.

Lloyd's Register of British and Foreign Shipping, London, E.C.—27*th April*, 1905.

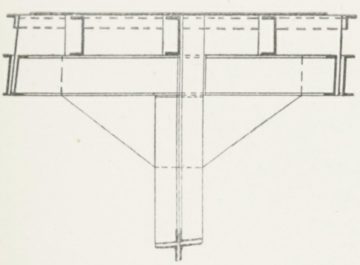
LONGITUDINAL PLAN.



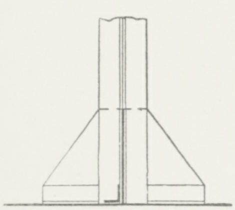
AT HEELS.



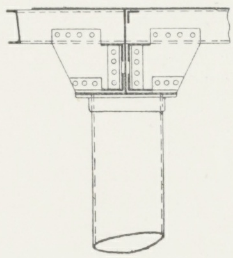
LONGITUDINAL PLAN.



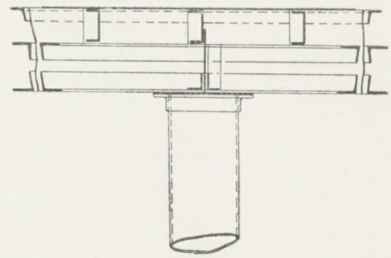
T AT HEELS



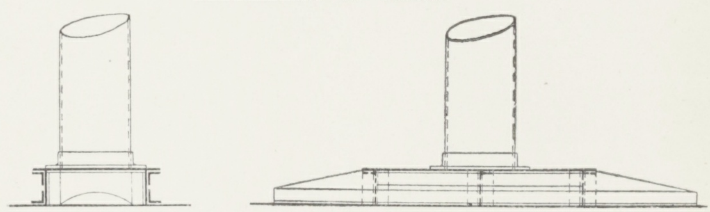
ATTACHMENT AT HEAD OF A TUBULAR PILLAR.



LONGITUDINAL PLAN.



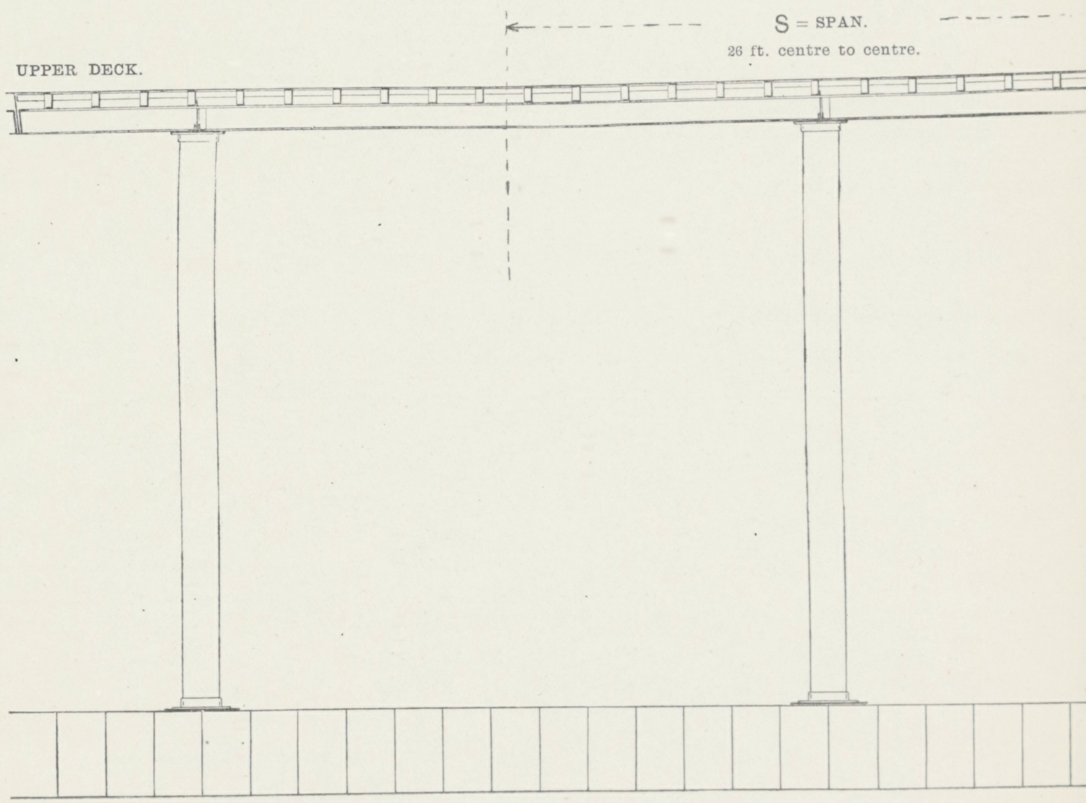
ATTACHMENT AT HEELS.



ose given in Tables S 1c and S 1d.

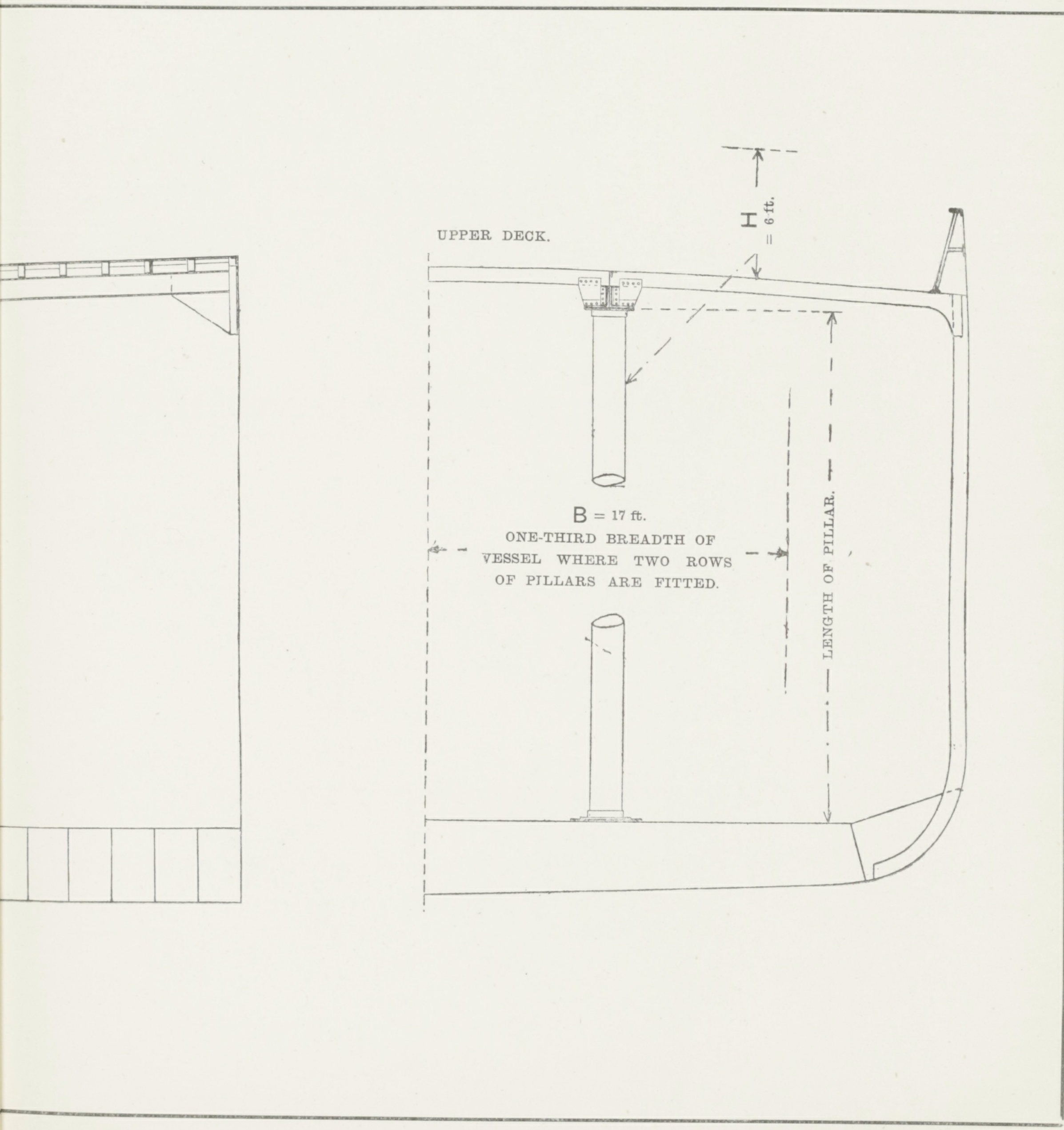
ction of floors and intercostals; but in cases wherein this cannot be done, intercostal brackets are to be

SKETCH SHOWING METHOD OF ESTIMATING



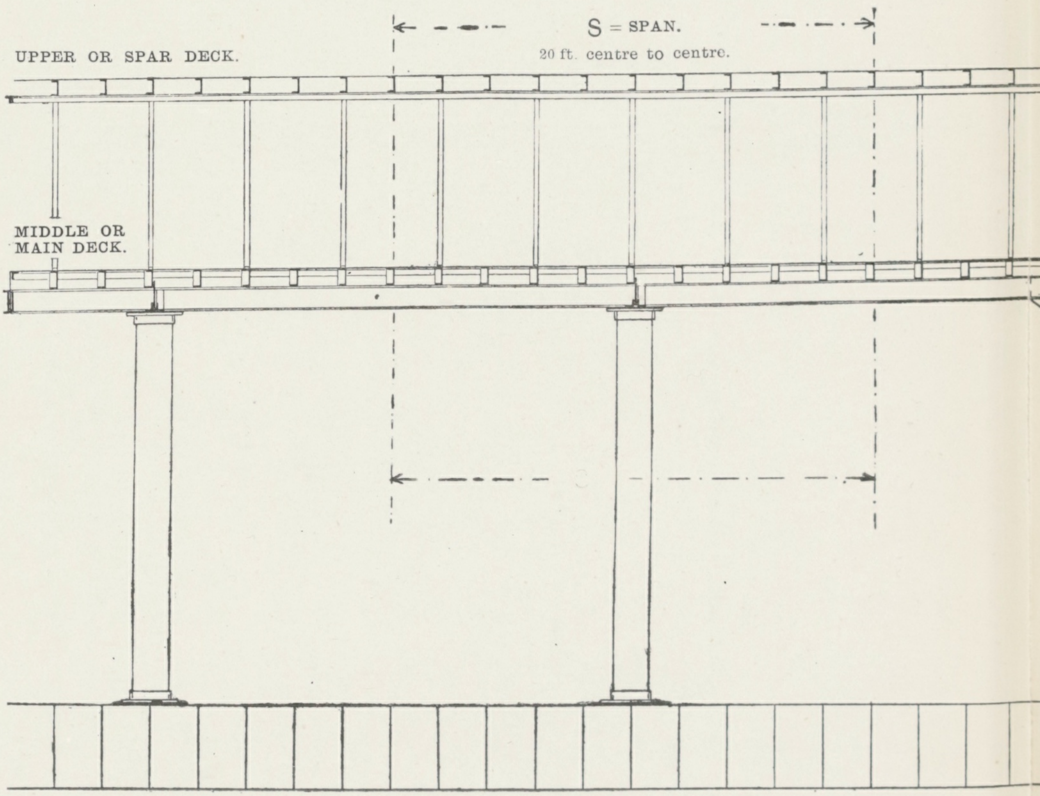
$$\text{Pillars}\ \frac{S \times B \times H}{100} = \frac{26 \times 17 \times 6}{100} = 26.$$

MBERS FOR REGULATING SIZES OF PILLARS.



WIDE SPACE

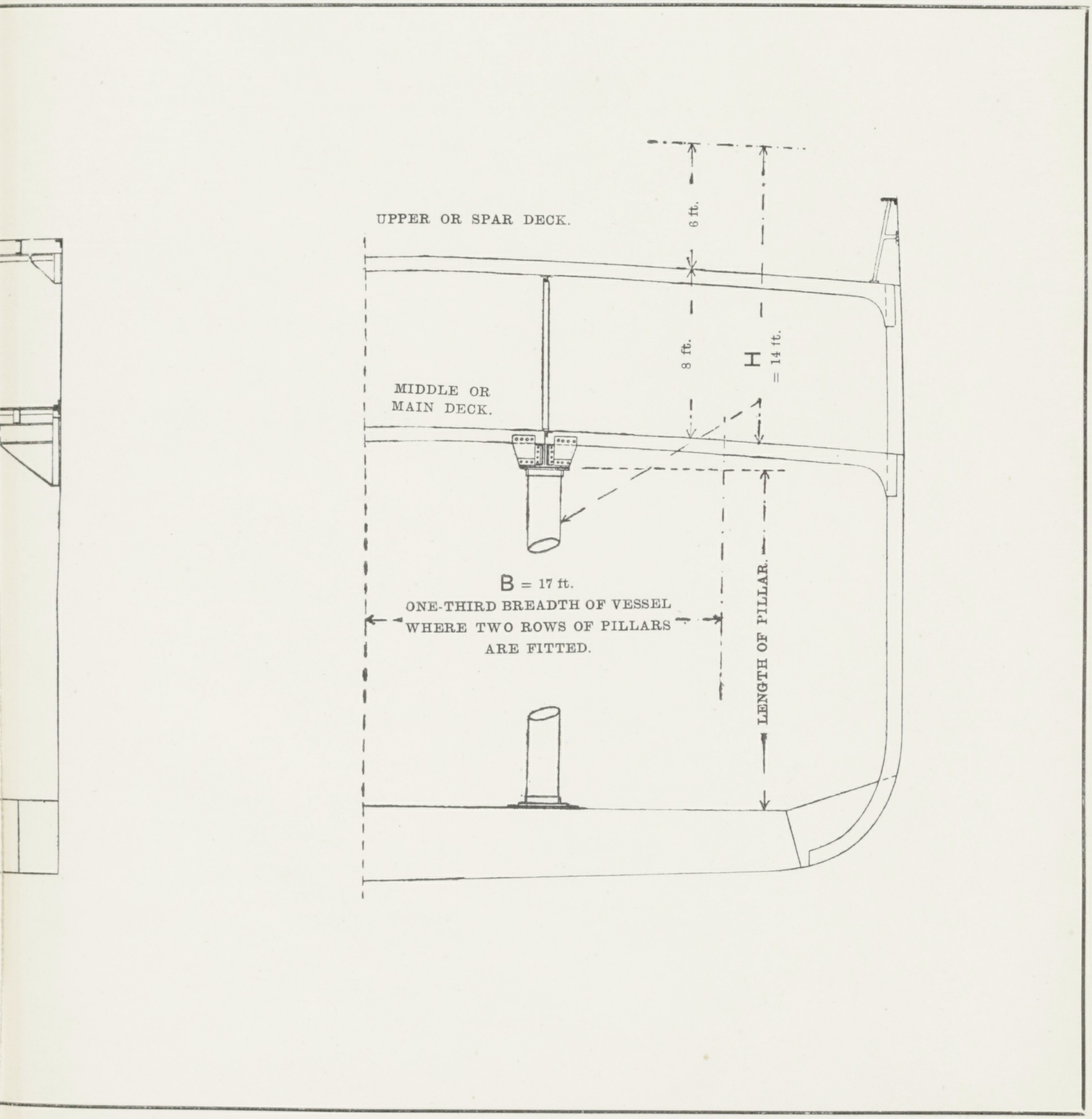
SKETCH SHOWING METHOD OF ESTIMATING NU



$$\text{Pillars } \frac{\mathbf{S} \times \mathbf{B} \times \mathbf{H}}{100} = \frac{20 \times 17 \times 14}{100} = 47.$$

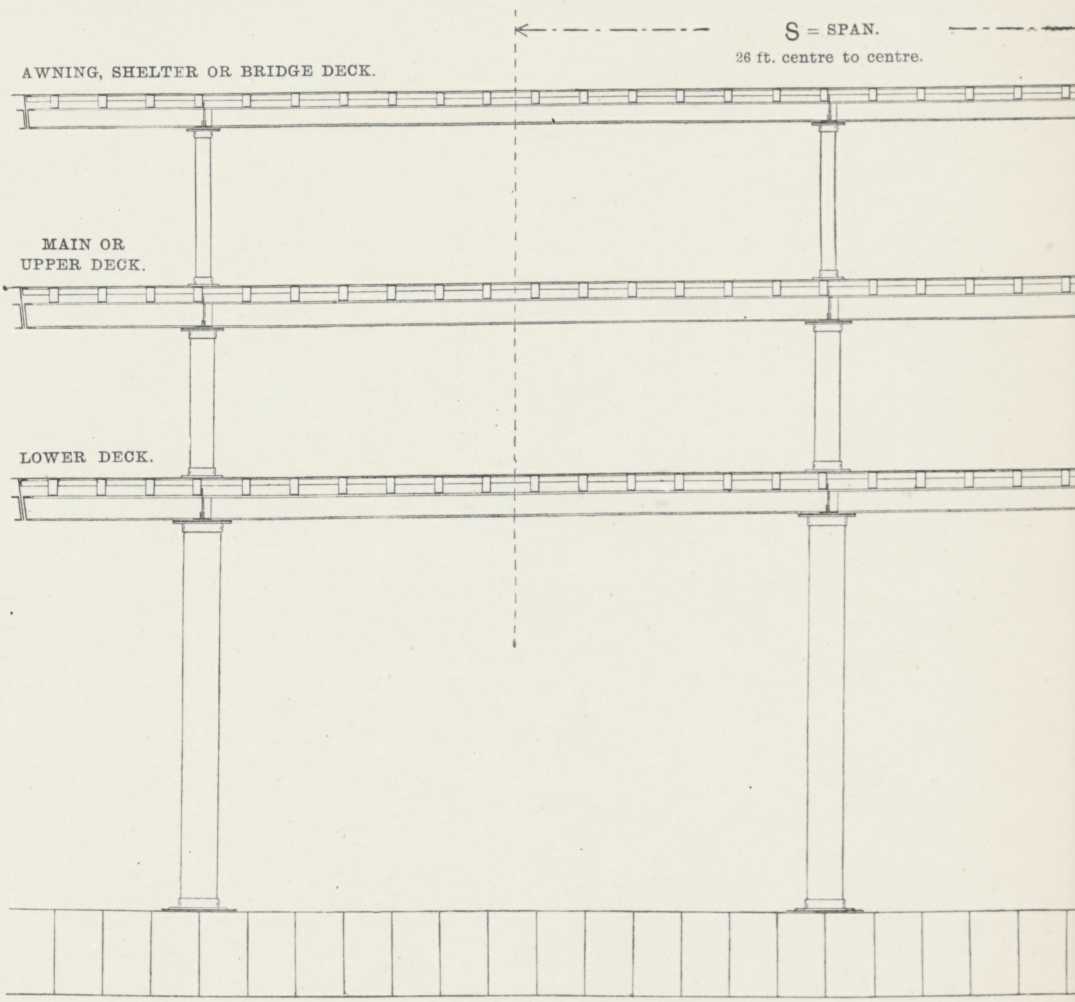
LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON, E.C.—27*th April*, 1905.

UMBERS FOR REGULATING SIZES OF PILLARS.



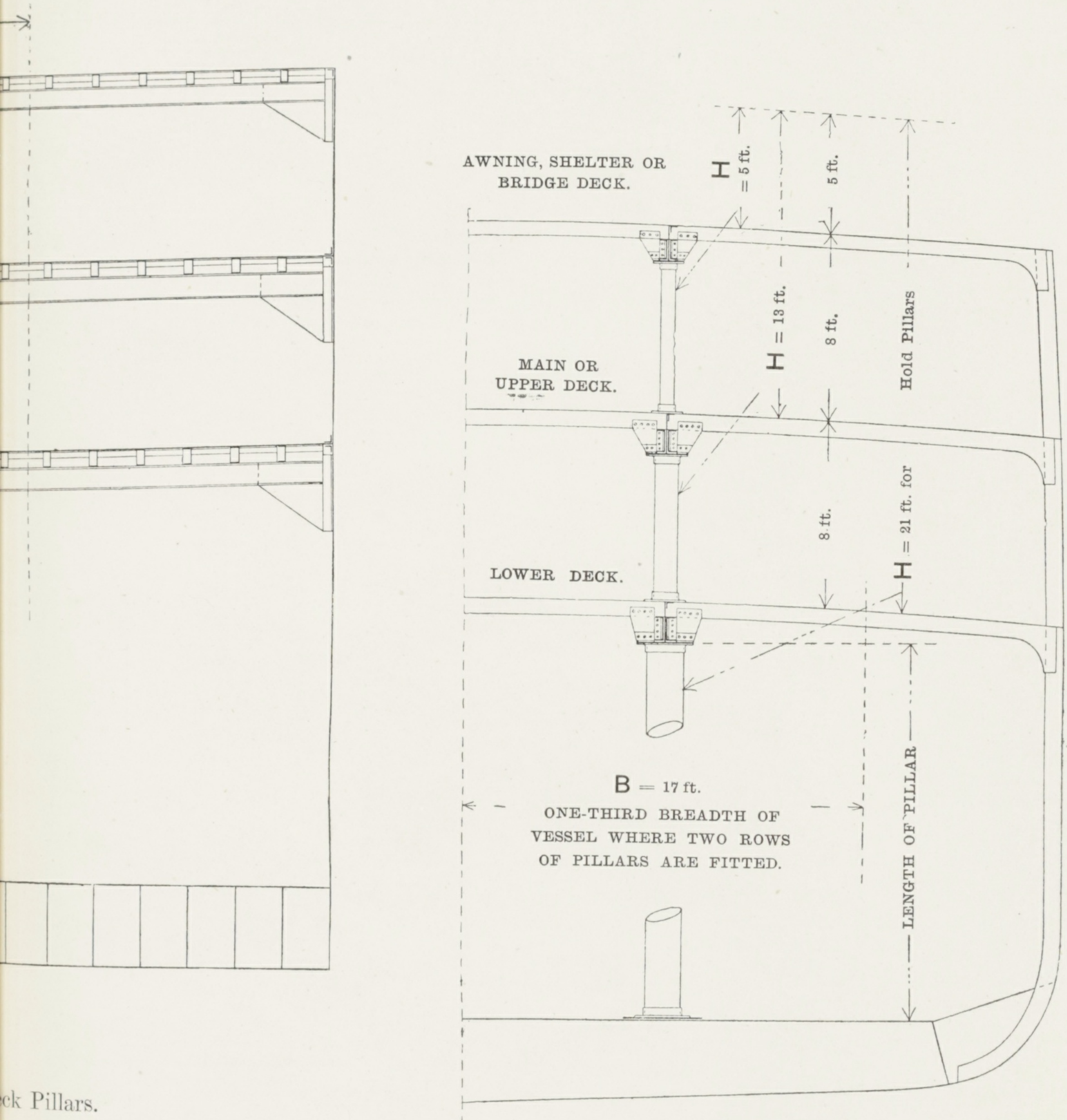
WIDE SPACE

SKETCH SHOWING METHOD OF ESTIMATING



$$\text{Pillars } \frac{S \times B \times H}{100} = \begin{cases} \frac{26 \times 17 \times 21}{100} = 92 \text{ for Hold Pillars.} \\ \frac{26 \times 17 \times 13}{100} = 57 \text{ for Lower 'Tween} \\ \frac{26 \times 17 \times 5}{100} = 22 \text{ for Upper 'Tween} \end{cases}$$

UMBERS FOR REGULATING SIZES OF PILLARS.

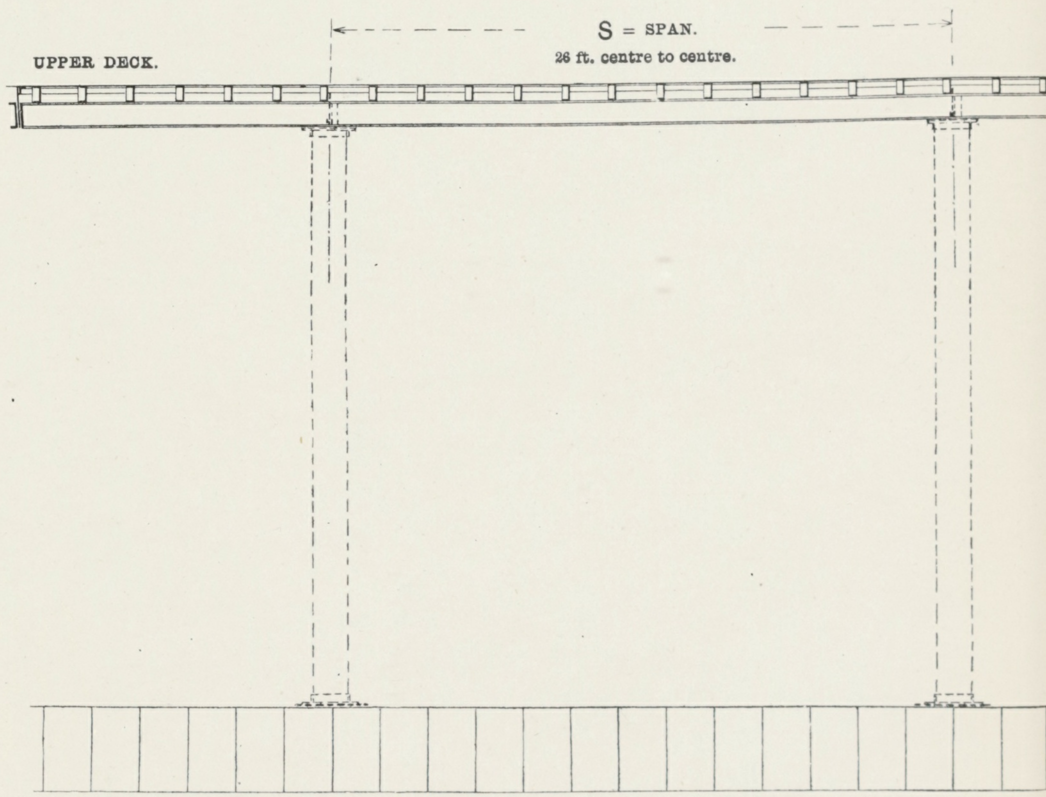


ck Pillars.

ck Pillars.

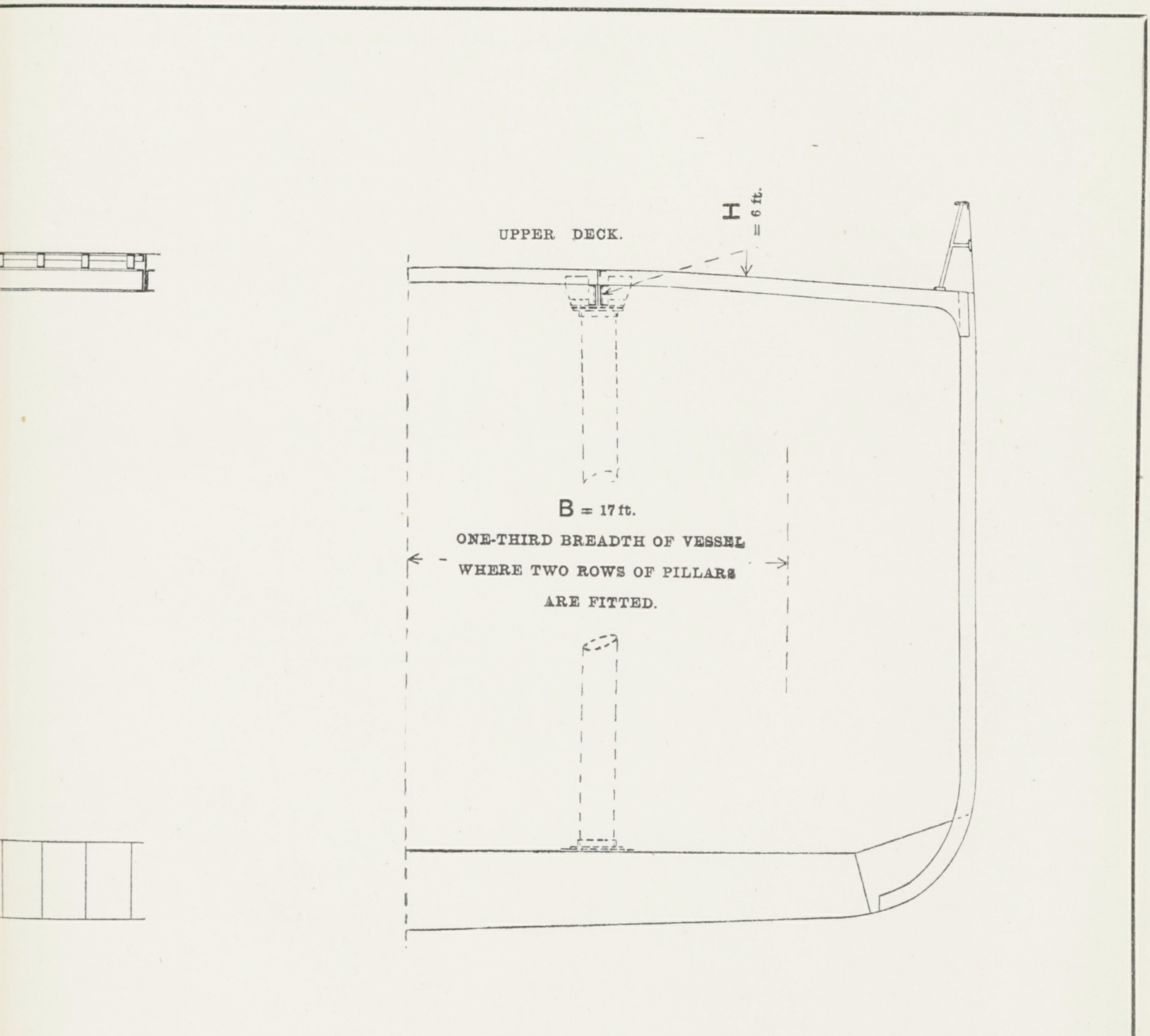
GIRDERS AT HEADS OF

SKETCH SHOWING METHOD OF ESTIMATING NU



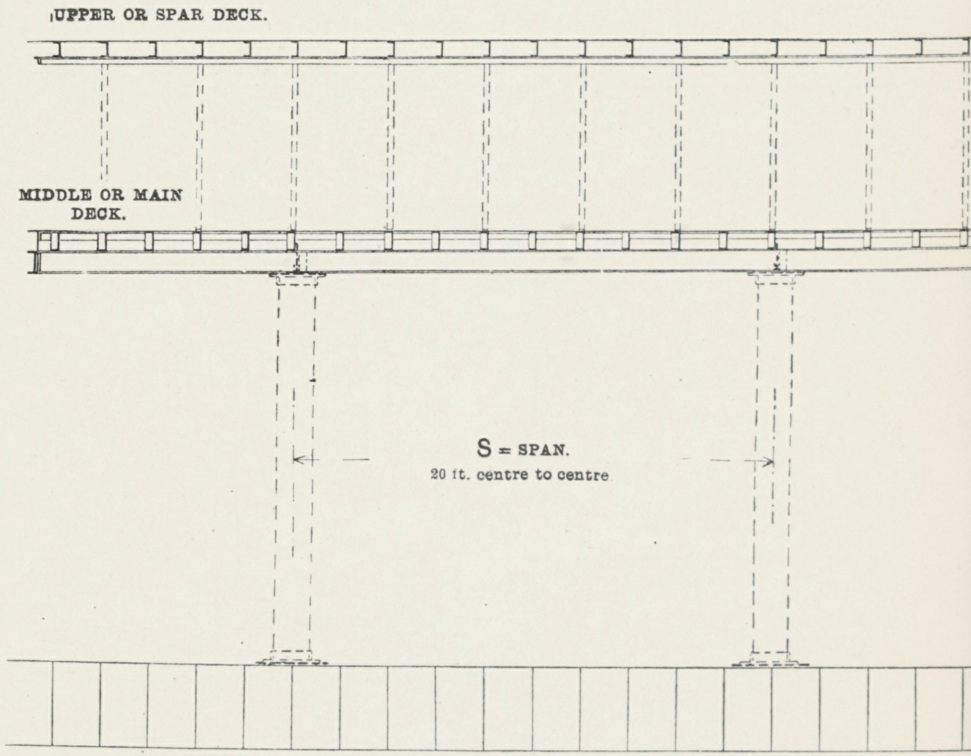
$$\text{Girders } \frac{S^2 \times B \times H}{100} = \frac{26^2 \times 17 \times 6}{100} = 689.$$

BERS FOR REGULATING SCANTLINGS OF GIRDERS.



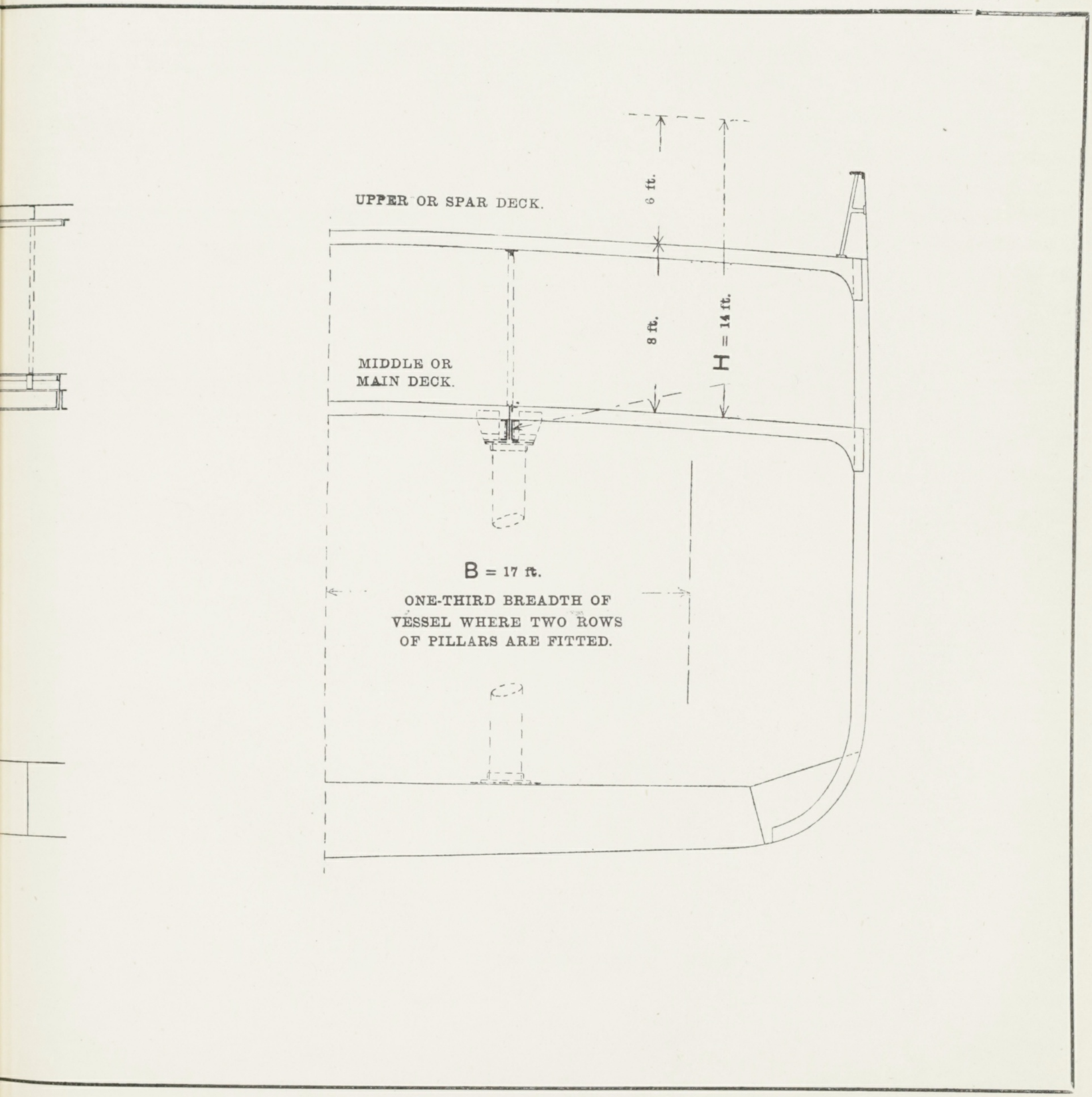
GIRDERS AT HEADS O

SKETCH SHOWING METHOD OF ESTIMATING NU



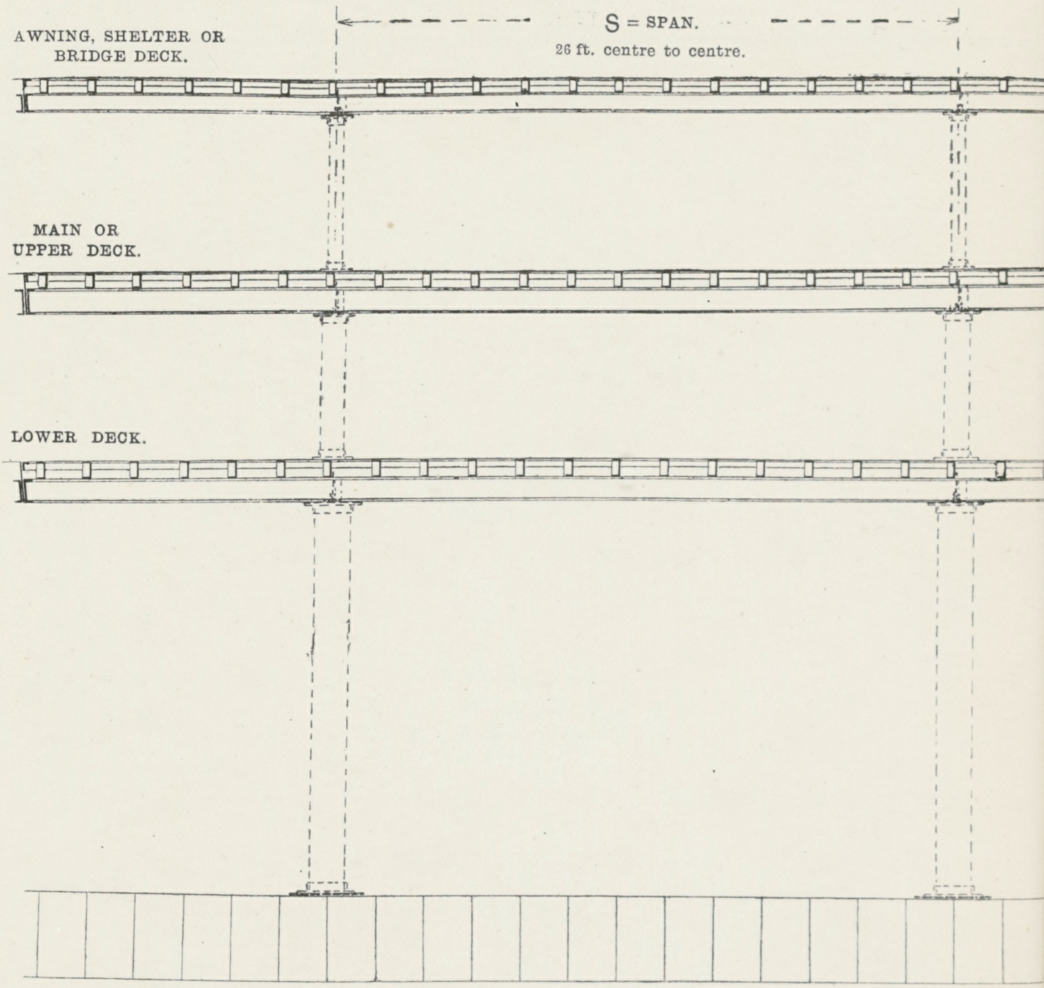
$$\text{Girders} \quad \frac{S^2 \times B \times H}{100} = \frac{20^2 \times 17 \times 14}{100} = 952.$$

ERS FOR REGULATING SCANTLINGS OF GIRDERS.



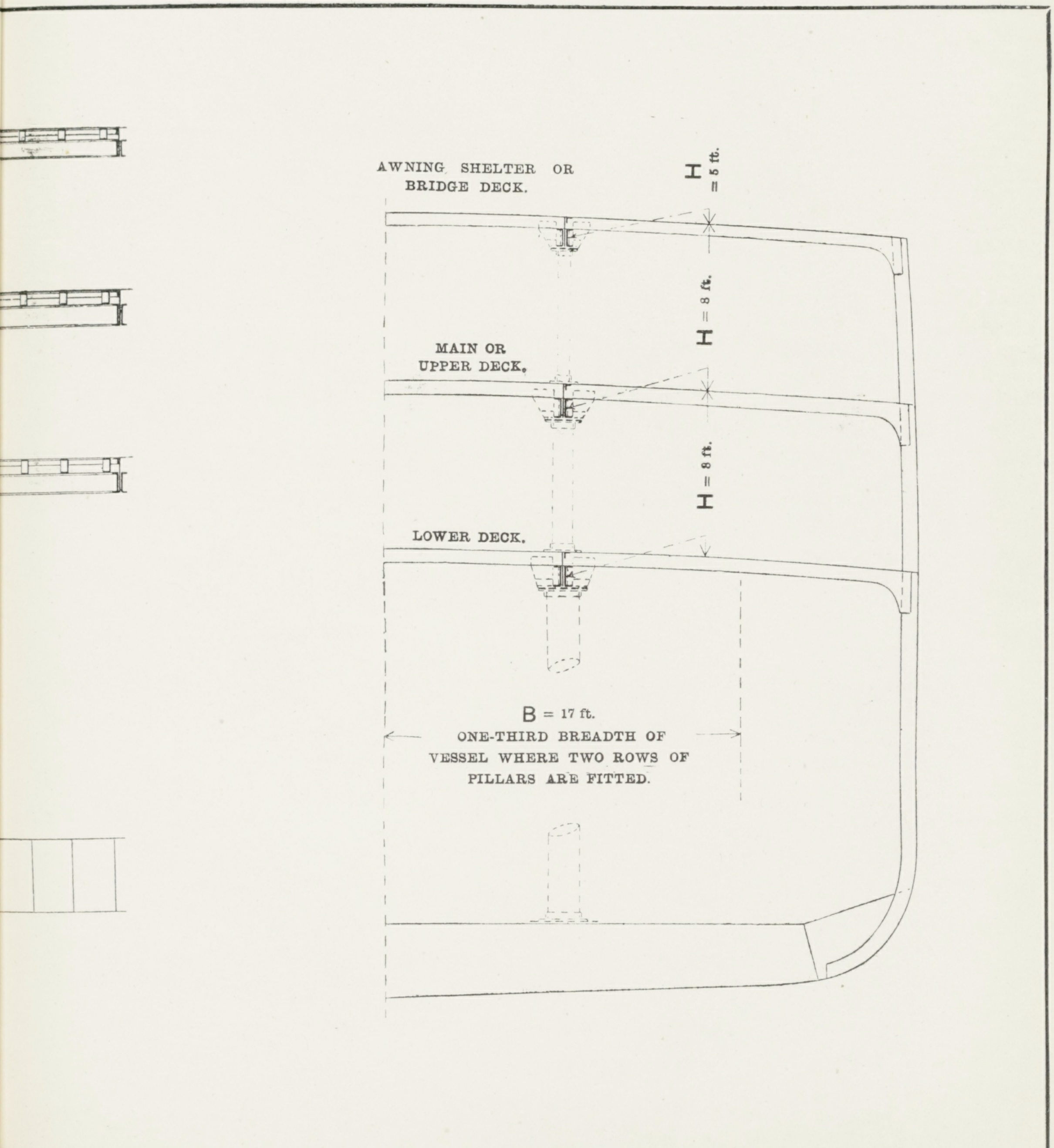
GIRDERS AT HEADS O

SKETCH SHOWING METHOD OF ESTIMATING N



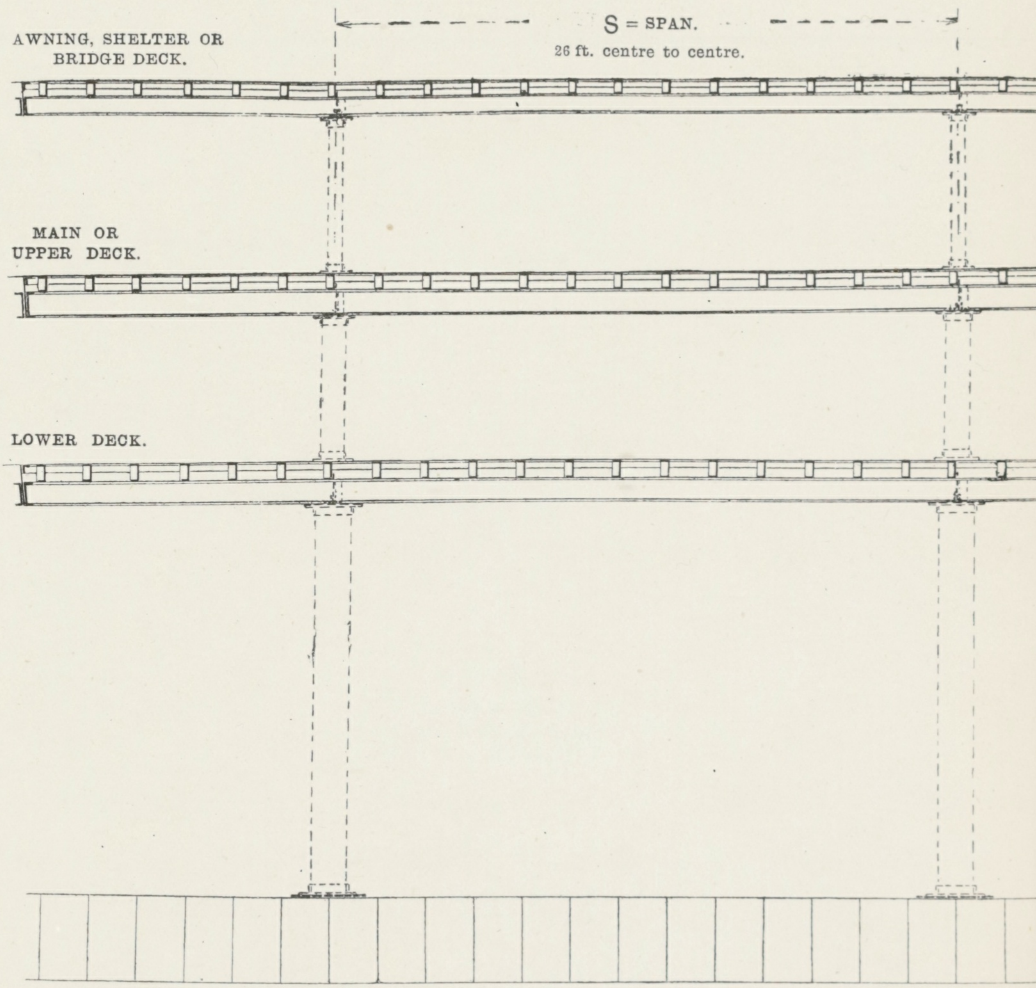
$$\text{Girders}\quad \frac{S^2 \times B \times H}{100} = \begin{cases} \dfrac{26^2 \times 17 \times 8}{100} = 919 \text{ for Lower Deck.} \\[2ex] \dfrac{26^2 \times 17 \times 8}{100} = 919 \text{ for Main Deck.} \\[2ex] \dfrac{26^2 \times 17 \times 5}{100} = 574 \text{ for Awning Deck.} \end{cases}$$

ERS FOR REGULATING SCANTLINGS OF GIRDERS.



GIRDERS AT HEADS O

SKETCH SHOWING METHOD OF ESTIMATING N

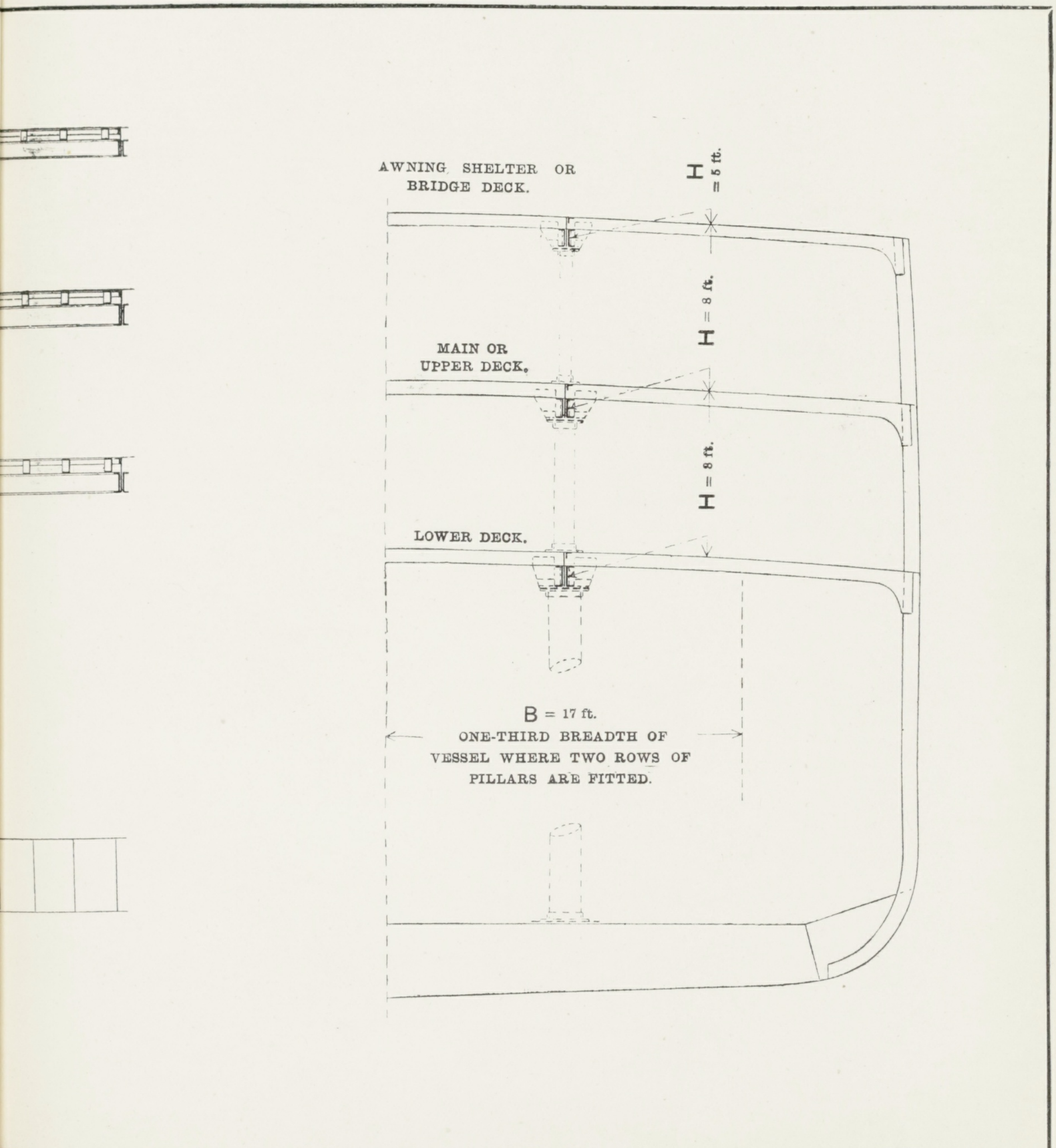


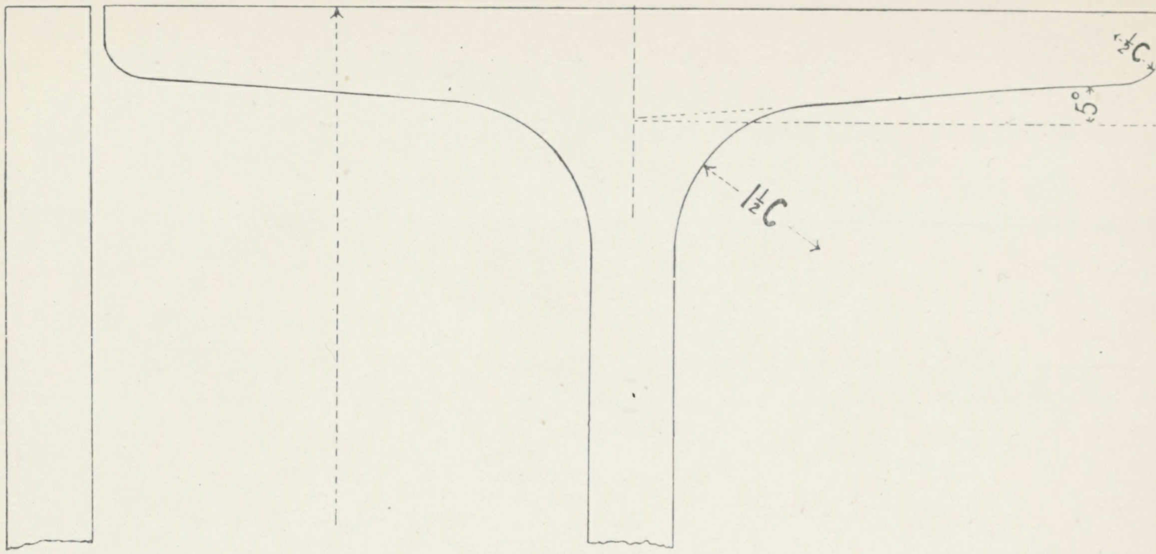
$$\text{Girders} \quad \frac{S^2 \times B \times H}{100} = \begin{cases} \dfrac{26^2 \times 17 \times 8}{100} = 919 \text{ for Lower Deck.} \\ \dfrac{26^2 \times 17 \times 8}{100} = 919 \text{ for Main Deck.} \\ \dfrac{26^2 \times 17 \times 5}{100} = 574 \text{ for Awning Deck.} \end{cases}$$

Lloyd's Register of British and Foreign Shipping, London, E.C.—27*th April*, 1905.

/IDE SPACED PILLARS.

ERS FOR REGULATING SCANTLINGS OF GIRDERS.

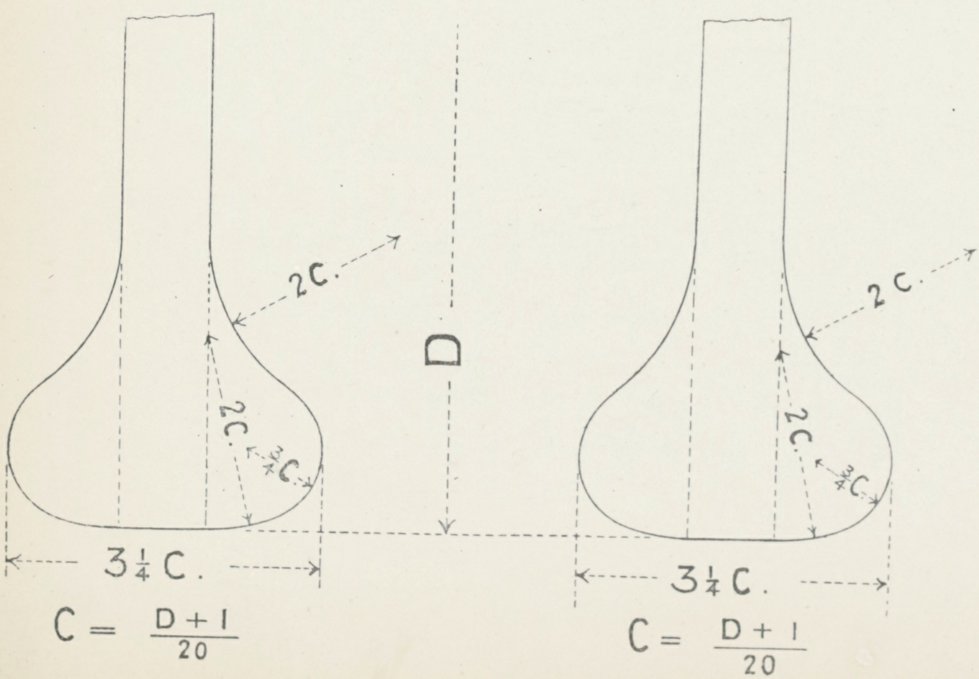




SKETCHES SHOWING WIDTH OF BULB OF BULB PLATES, T BULBS, AND BULB ANGLES.

The depth in inches D of the section to be the base from which to deduce the other dimensions. The widths of the bulbs to be $2\frac{1}{2}$ C for bulb angles, and $3\frac{1}{4}$ C for bulb plates and bulb tees—where C is $\frac{D+3}{20}$ in the case of bulb angles, and $\frac{D+1}{20}$ for bulb plates and bulb tees. The form of the bulbs to be in accordance with the sketches.

The standard thickness for regulating the width of bulb of beams and bars whose depth is not an exact number of inches should correspond to the depth in inches next below the actual depth, thus—for T beams and bulb plates $10\frac{1}{2}$ inches deep, the standard thickness to be used in determining the dimensions of the bulb should be $\frac{10+1}{20}$ or $\frac{11.}{20}$



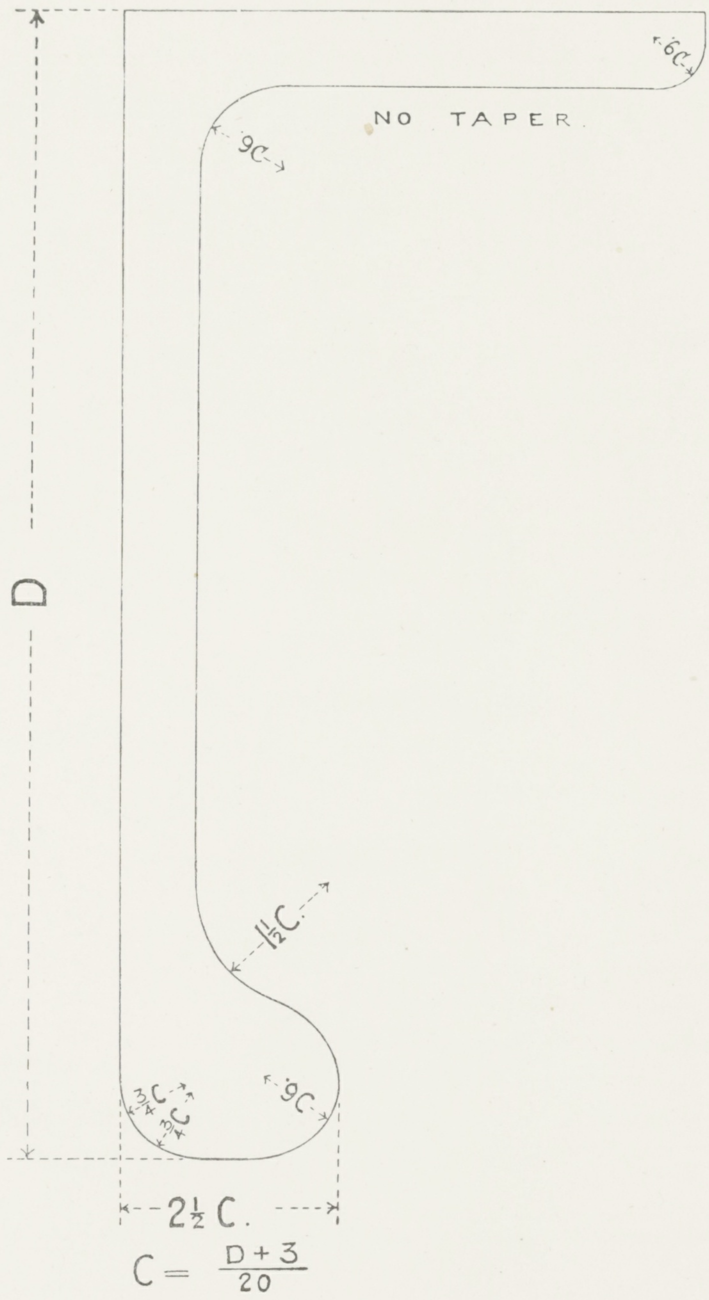
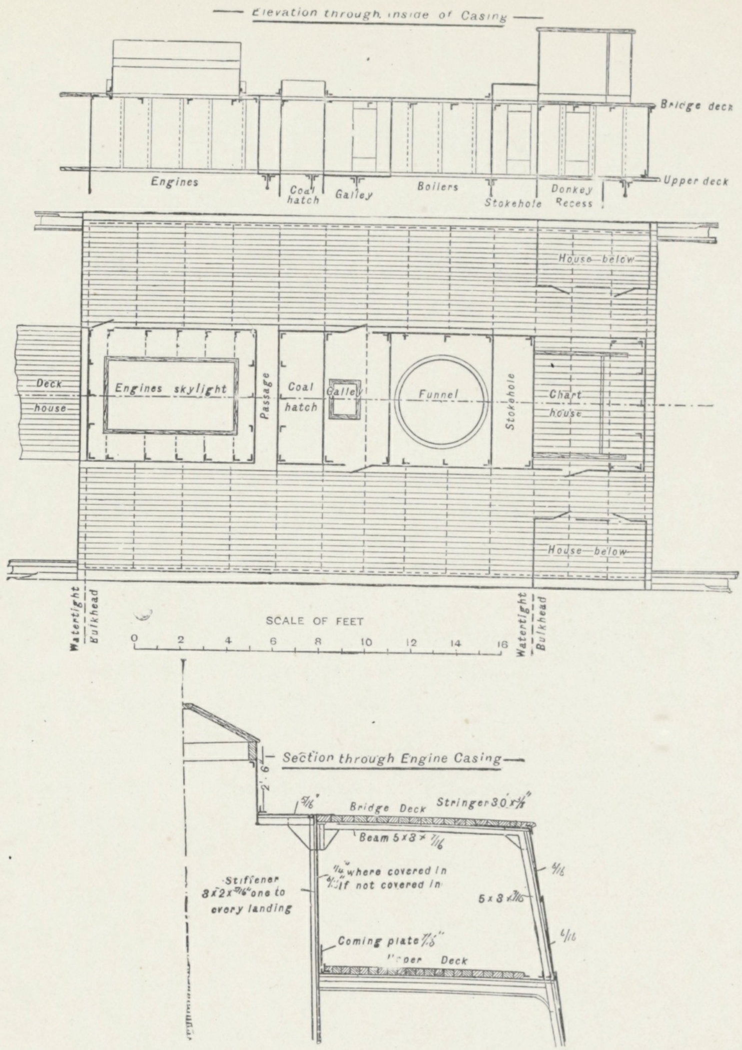

NO TAPER.
·6C
·9C
D
1½C.
·9C
¾C
¾C
2½C.
C = D+3 / 20

FIG. 1.



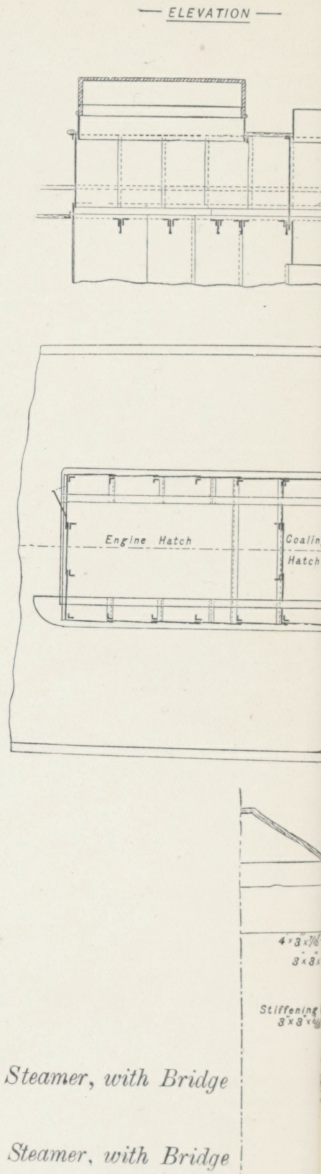
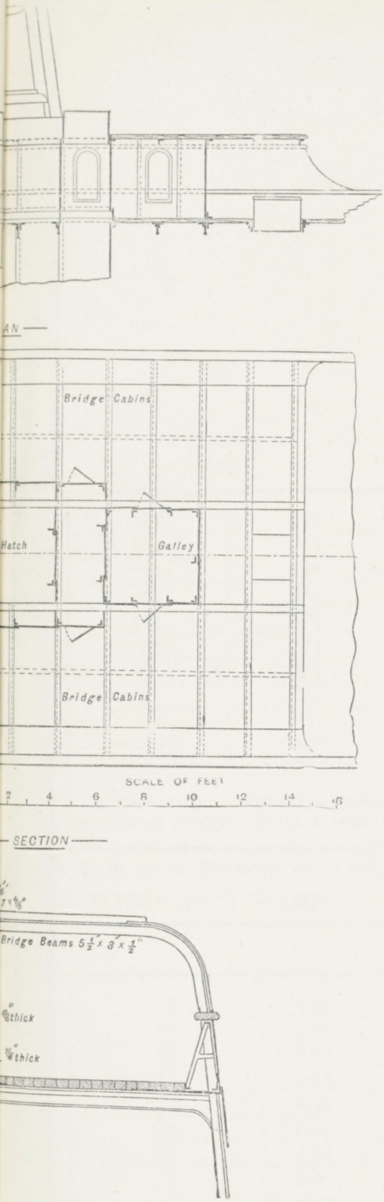


Fig. 1.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck extending the whole length of the Openings.*

Fig. 2.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck covering the Boiler Hatchway.*

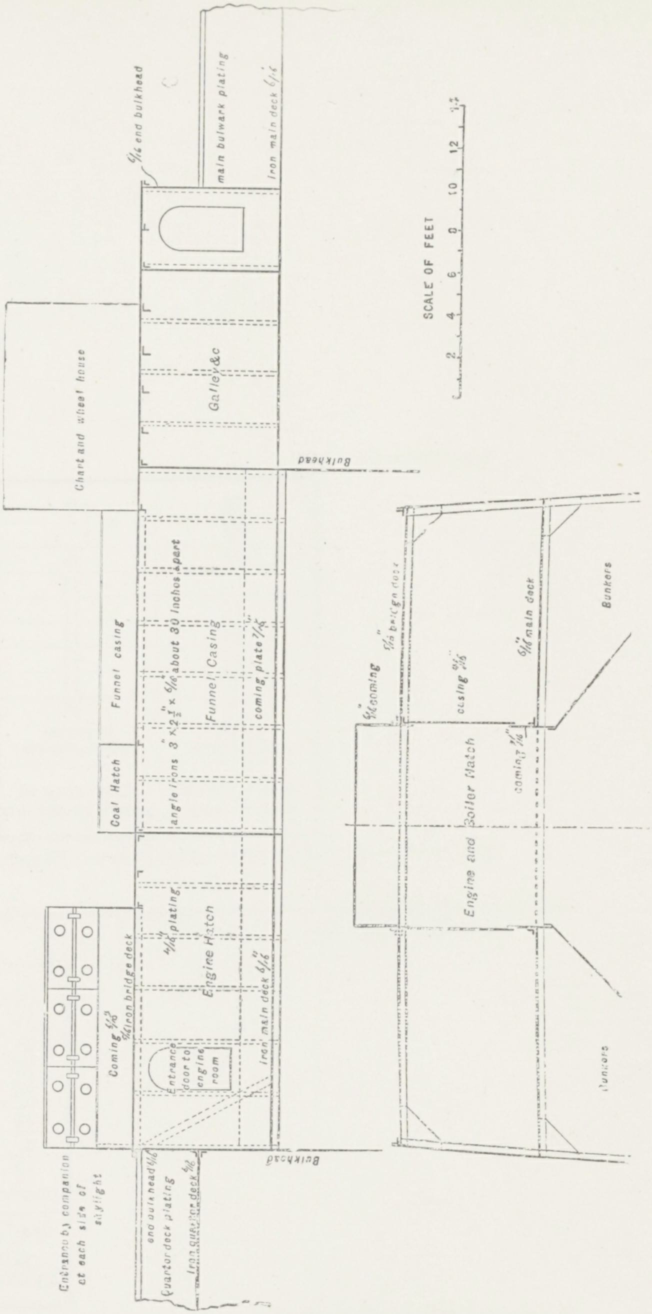
Fig. 3.—*Sketch of Engine and Boiler Casings in a Vessel with a Long Raised Quarter Deck and Enclosed Bridge House.*

. 2.



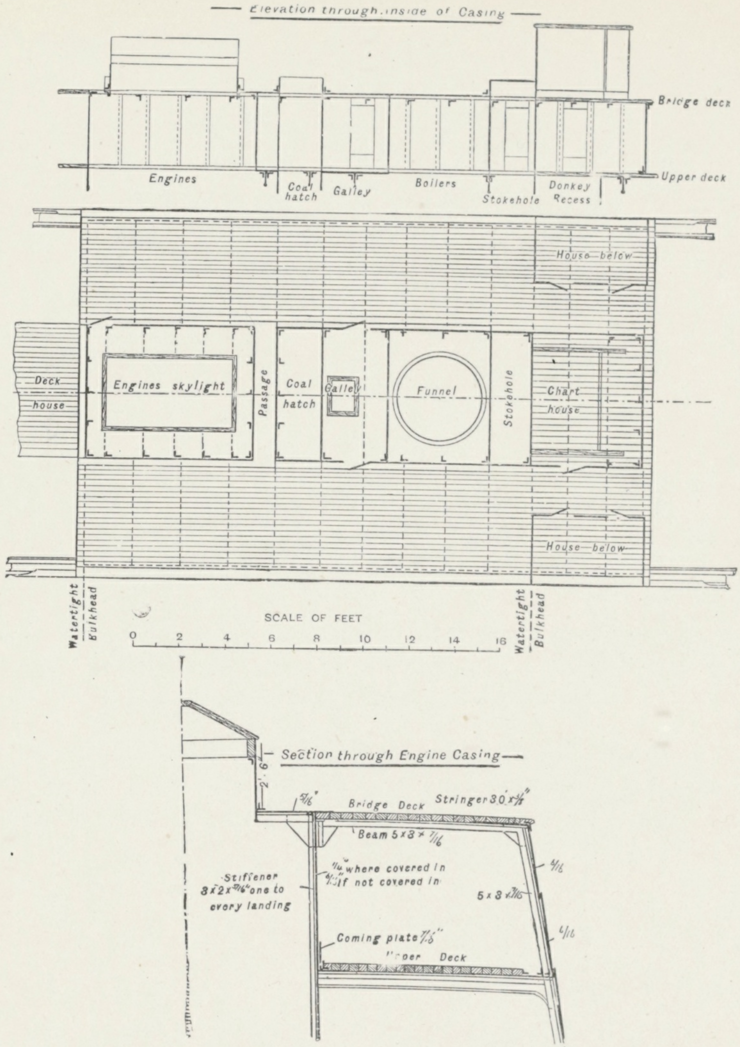
AN
Bridge Cabins
Hatch
Galley
Bridge Cabins
SCALE OF FEET
2 4 6 8 10 12 14 16
SECTION
Bridge Beams
thick
thick

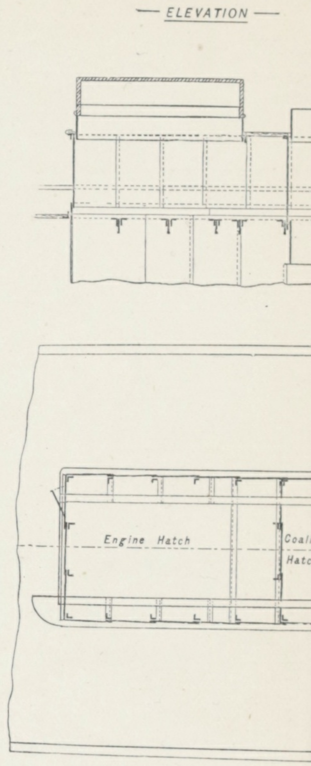
FIG 3.



end bulkhead
main bulwark plating
iron main deck
SCALE OF FEET
2 4 6 8 10 12
Chart and wheel house
Galley &c
Bulkhead
Funnel casing
angle irons
about 30 inches apart
Funnel Casing
coming plate
Coal Hatch
Coming
iron bridge deck
plating
Engine Hatch
iron main deck
Entrance door to engine room
Bulkhead
end bulkhead
quarter deck plating
iron quarter deck
Entrance by companion at each side of skylight
coming
bridge deck
main deck
Bunkers
casing
Engine and Boiler Hatch
coming
Bunkers

FIG. 1.





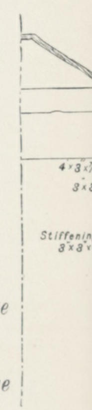
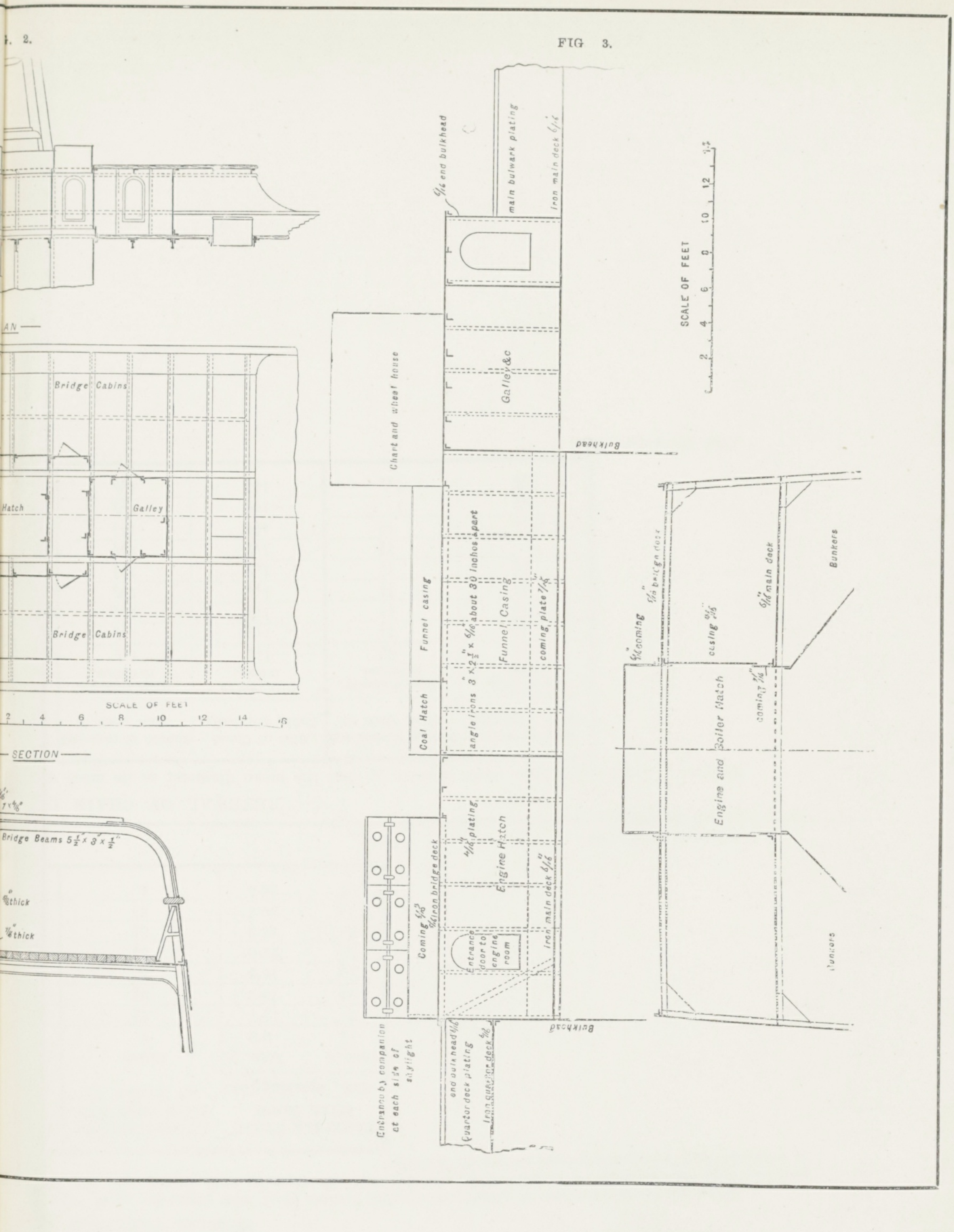


Fig. 1.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck extending the whole length of the Openings.*

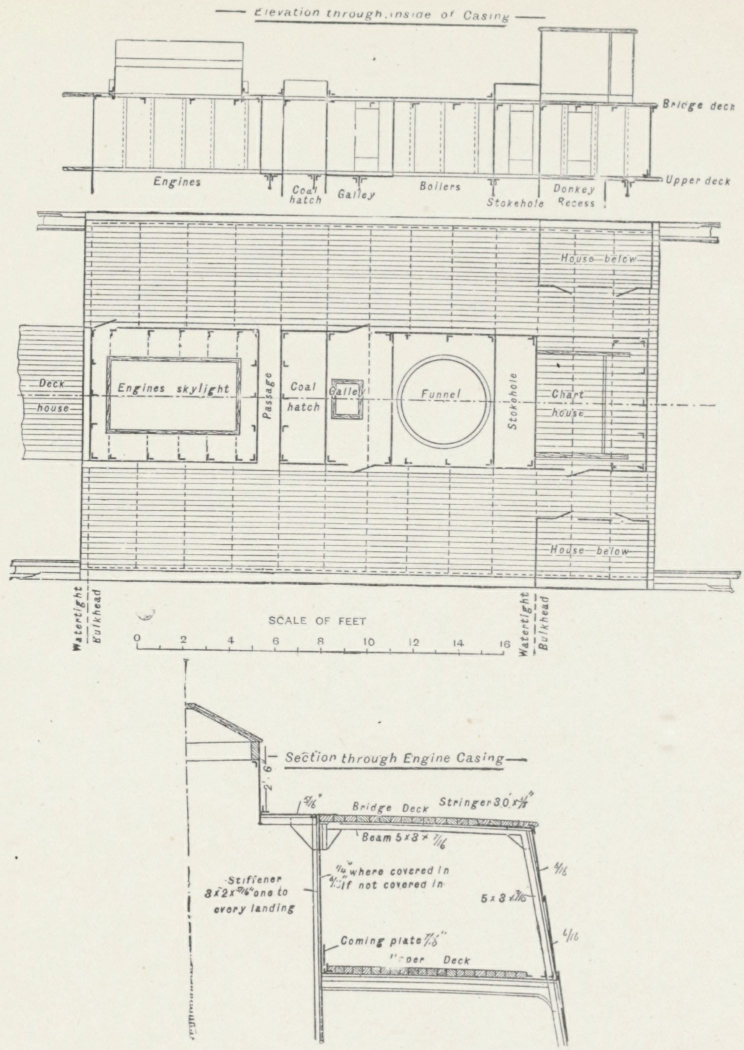
Fig. 2.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck covering the Boiler Hatchway.*

Fig. 3.—*Sketch of Engine and Boiler Casings in a Vessel with a Long Raised Quarter Deck and Enclosed Bridge House.*



. 2.
FIG 3.
AN
Bridge Cabins
Hatch
Galley
Bridge Cabins
SCALE OF FEET
2 4 6 8 10 12 14 16
SECTION
Bridge Beams $5\frac{1}{2}'' \times 3'' \times \frac{1}{2}''$
thick
thick
main bulwark plating
iron main deck
end bulkhead
Chart and wheel house
Galley &c
Bulkhead
Funnel casing
Coal Hatch
angle irons $3'' \times 2\frac{1}{2}'' \times$ about 30 inches apart
Funnel Casing
coming plate
plating
Engine Hatch
iron bridge deck
Coming
iron main deck
Entrance door to engine room
Entrance by companion at each side of skylight
end bulkhead
Quarter deck plating
Iron quarter deck
Bulkhead
SCALE OF FEET
2 4 6 8 10 12
Bunkers
main deck
casing
coming
bridge deck
Engine and Boiler Hatch
Bunkers

FIG. 1.



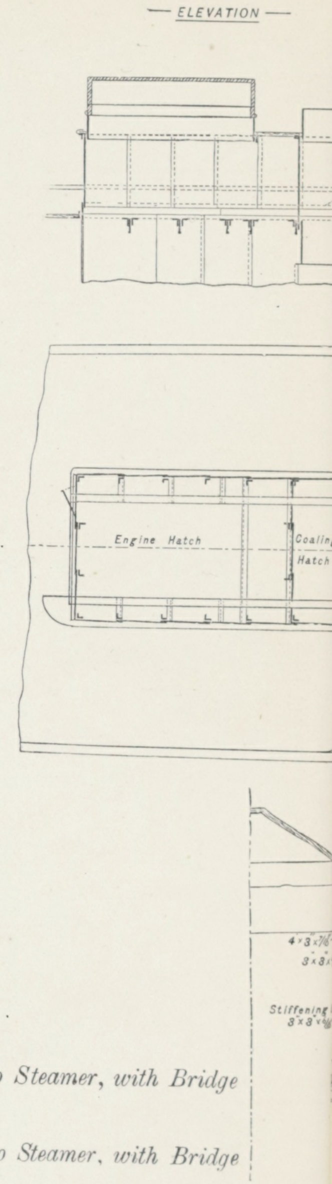


Fig. 1.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck extending the whole length of the Openings.*

Fig. 2.—*Sketch of Engine and Boiler Casing of a Three-decked Cargo Steamer, with Bridge Deck covering the Boiler Hatchway.*

Fig. 3.—*Sketch of Engine and Boiler Casings in a Vessel with a Long Raised Quarter Deck and Enclosed Bridge House.*

. 2.

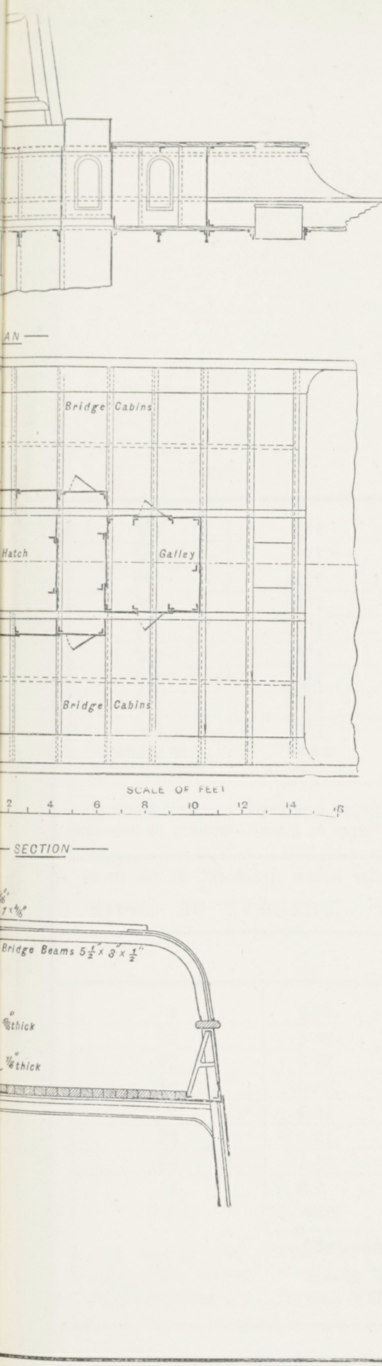
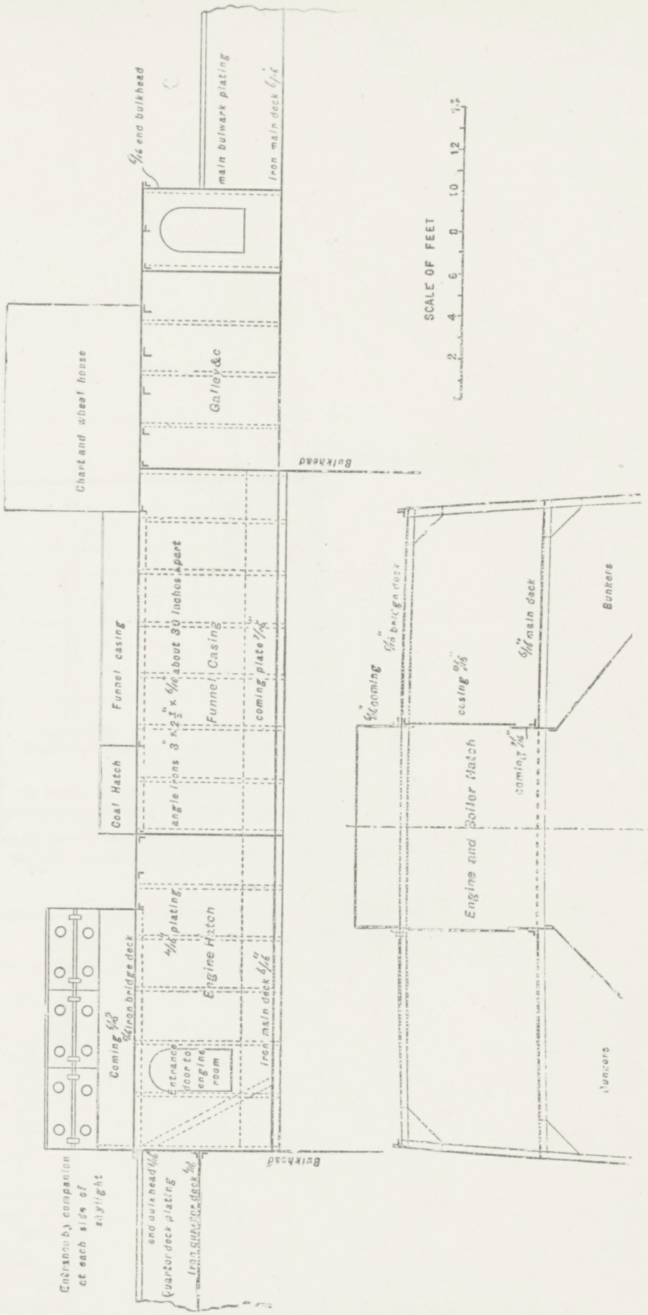

AN
Bridge Cabins
Hatch
Galley
Bridge Cabins
SCALE OF FEET
SECTION
Bridge Beams 5½ x 3 x ½
thick
thick

FIG 3.


end bulkhead
main bulwark plating
iron main deck
SCALE OF FEET
Chart and wheel house
Galley &c
Bulkhead
Funnel casing
Coal Hatch
angle irons 3 x 2½ x 5/16 about 30 inches apart
Funnel Casing
coming plate
Engine Hatch
plating
iron main deck
Coming
iron bridge deck
Entrance door to engine room
Bulkhead
end bulkhead
Quarter deck plating
iron quarter deck
Entrance by companion at each side of skylight
coming
bridge deck
main deck
casing
Bunkers
Engine and Boiler Hatch
Bunkers

Each wire will be required to be capable of being twisted around itself not less than ei

Each manufacturer to be required to provide on his premises machines suitable for satis of the Society's Surveyors, who are to be empowered to retest any hawser or towline for which

Printed Forms of Certificates, approved by the Committee, to be given by the Manufact

20th December, 1883.

SPECIAL FLEXIBLE S

When an Owner prefers to substitute special flexible steel wire ropes for steel wire provided each flexible rope be formed of six strands with 24 wires in each strand, and that tl of withstanding the breaking tests shown in the table :

Flexible Steel Wire Rope. Size.	Flexible Steel Wire Rope. Breaking Test.	Corresponding Sizes required by Table 22.	I
Inches.	Tons.	Inches.	I
$1\frac{3}{4}$	8·9	2	
2	11·7	$2\frac{1}{4}$	
$2\frac{1}{2}$	18·2	$2\frac{3}{4}$	
$2\frac{1}{2}$	18·2	3	
$2\frac{3}{4}$	22·0	$3\frac{1}{4}$	
3	26·2	$3\frac{1}{2}$	
$3\frac{1}{4}$	30·7	$3\frac{3}{4}$	
$3\frac{1}{2}$	35·5	4	

15th December, 1898.

RENEWAL OF CHAIN C

When any length of a chain cable is worn so that the mean diameter at its most w

Size of Chain Cable originally.	Should be renewed when worn to	Size of Chain Cable originally.	Should be renewed when worn to
Diameter in inches.	Mean diameter in inches.	Diameter in inches.	Mean diameter in inches.
$\frac{11}{16}$	$\frac{20}{32}$	$1\frac{4}{16}$	$1\frac{2}{16}$
$\frac{12}{16}$	$\frac{21}{32}$	$1\frac{5}{16}$	$1\frac{3}{16}$
$\frac{13}{16}$	$\frac{23}{32}$	$1\frac{6}{16}$	$1\frac{7}{32}$
$\frac{14}{16}$	$\frac{25}{32}$	$1\frac{7}{16}$	$1\frac{9}{32}$
$\frac{15}{16}$	$\frac{27}{32}$	$1\frac{8}{16}$	$1\frac{11}{32}$
1	$\frac{29}{32}$	$1\frac{9}{16}$	$1\frac{13}{32}$
$1\frac{1}{16}$	$\frac{15}{16}$	$1\frac{10}{16}$	$1\frac{15}{32}$
$1\frac{2}{16}$	1	$1\frac{11}{16}$	$1\frac{8}{16}$
$1\frac{3}{16}$	$1\frac{1}{16}$	$1\frac{12}{16}$	$1\frac{9}{16}$

17th December, 1903.

CHAINS AND ANCHORS FOR SAILING VESSELS.

TABLE 22.

Minimum Weights of Anchors, ex. Stock; Sizes, Lengths and Weights of Chains, and the Proof Strain to which they are to be tested per Chain Cables and Anchors Acts. Also Sizes and Lengths of Towlines, Hawsers and Warps. The Anchors, and the links of the Chains to be of unexceptionable form and proportions.

ANCHORS.

Numbers for IRON AND STEEL Vessels. See Note (a)	Letters for Equipment as inserted in Register Book. Column 8.	GROSS TONNAGE LESS CREW SPACE. See Note†	NUMBER. Bowers	NUMBER. Stream	NUMBER. Kedge	BOWER ANCHORS (b) (d). Ex. Stock. Weight	Test.*	Collective Weight.	STREAM AND KEDGE ANCHORS. (b) (d) Ex. Stock. Stream.	Test.*	Kedge.	Test.*
		Tons.				Cwts.	Tons.	Cwts.	Cwts.	Tons.	Cwts.	Tons.
1900 and under 2500	a	50 and under 75	2	1	1	$3\frac{1}{2}$	$5\frac{18}{20}$	7	$\frac{3}{4}$	—	$\frac{1}{2}$	—
2500 ,, 3100	b	75 ,, 100	2	1	1	$4\frac{1}{4}$	$6\frac{12}{20}$	$8\frac{1}{2}$	$1\frac{1}{4}$	$3\frac{13}{20}$	$\frac{1}{2}$	—
3100 ,, 3650	c	100 ,, 125	2	1	1	5	$7\frac{7}{20}$	10	$1\frac{1}{2}$	$3\frac{18}{20}$	$\frac{3}{4}$	—
3650 ,, 4200	d	125 ,, 150	2	1	1	$5\frac{3}{4}$	8	$11\frac{1}{2}$	$1\frac{1}{2}$	$3\frac{18}{20}$	$\frac{3}{4}$	—
4200 ,, 4700	e	150 ,, 175	2	1	1	$6\frac{1}{2}$	$8\frac{15}{20}$	13	2	$4\frac{10}{20}$	1	—
4700 ,, 5150	f	175 ,, 200	2	1	1	$7\frac{1}{4}$	$9\frac{9}{20}$	$14\frac{1}{2}$	$2\frac{1}{4}$	$4\frac{15}{20}$	1	—
5150 ,, 6000	g	200 ,, 250	3	1	1	$8\frac{1}{4}$	$10\frac{7}{20}$	$23\frac{1}{2}$	$2\frac{1}{2}$	5	$1\frac{1}{4}$	$3\frac{13}{20}$
6000 ,, 6800	h	250 ,, 300	3	1	1	10	12	$28\frac{1}{2}$	$3\frac{3}{4}$	$6\frac{3}{20}$	$1\frac{3}{4}$	$4\frac{4}{20}$
6800 ,, 7550	i	300 ,, 350	3	1	1	12	$13\frac{17}{20}$	$34\frac{1}{4}$	4	$6\frac{7}{20}$	2	$4\frac{10}{20}$
7550 ,, 8250	j	350 ,, 400	3	1	1	$13\frac{1}{2}$	$15\frac{3}{20}$	$38\frac{1}{2}$	$4\frac{3}{4}$	$7\frac{2}{20}$	$2\frac{1}{2}$	5
8250 ,, 8900	k	400 ,, 450	3	1	1	$15\frac{1}{4}$	$16\frac{14}{20}$	$43\frac{1}{2}$	$5\frac{1}{4}$	$7\frac{11}{20}$	$2\frac{1}{2}$	5
8900 ,, 9600	l	450 ,, 500	3	1	1	$16\frac{3}{4}$	18	$47\frac{3}{4}$	$5\frac{1}{2}$	$7\frac{16}{20}$	$2\frac{3}{4}$	$5\frac{5}{20}$
9600 ,, 10800	m	500 ,, 600	3	1	1	18	19	$51\frac{1}{4}$	$6\frac{1}{2}$	$8\frac{15}{20}$	$3\frac{1}{4}$	$5\frac{14}{20}$
10800 ,, 12000	n	600 ,, 700	3	1	1	21	$21\frac{12}{20}$	60	$7\frac{1}{4}$	$9\frac{9}{20}$	$3\frac{1}{2}$	$5\frac{18}{20}$
12000 ,, 13200	o	700 ,, 800	3	1	1	$23\frac{1}{2}$	$23\frac{10}{20}$	67	8	$10\frac{2}{20}$	4	$6\frac{7}{20}$
13200 ,, 14400	p	800 ,, 900	3	1	1	$25\frac{1}{2}$	$25\frac{3}{20}$	$72\frac{3}{4}$	$8\frac{1}{2}$	$10\frac{12}{20}$	$4\frac{1}{4}$	$6\frac{12}{20}$
14400 ,, 15500	q	900 ,, 1000	3	1	1	$27\frac{3}{4}$	$26\frac{18}{20}$	79	$8\frac{3}{4}$	$10\frac{17}{20}$	$4\frac{1}{2}$	$6\frac{17}{20}$
15500 ,, 17600	r	1000 ,, 1200	3	1	1	30	$28\frac{12}{20}$	$85\frac{1}{2}$	$9\frac{1}{2}$	$11\frac{11}{20}$	$4\frac{3}{4}$	$7\frac{2}{20}$
17600 ,, 19600	s	1200 ,, 1400	3	1	1	32	$30\frac{2}{20}$	$91\frac{1}{4}$	$10\frac{1}{2}$	$12\frac{8}{20}$	$5\frac{1}{4}$	$7\frac{11}{20}$
19600 ,, 21600	t	1400 ,, 1600	3	1	1	34	$31\frac{12}{20}$	97	$10\frac{3}{4}$	$12\frac{13}{20}$	$5\frac{1}{2}$	$7\frac{16}{20}$
21600 ,, 23400	u	—	3	1	1	$36\frac{1}{2}$	$33\frac{8}{20}$	104	$11\frac{1}{4}$	$13\frac{2}{20}$	$5\frac{1}{2}$	$7\frac{16}{20}$
23400 ,, 25100	v	—	3	1	1	38	$34\frac{10}{20}$	$108\frac{1}{4}$	$11\frac{1}{2}$	$13\frac{7}{20}$	$5\frac{3}{4}$	8
25100 ,, 29400	w	—	3	1	1	40	$35\frac{15}{20}$	114	12	$13\frac{17}{20}$	6	$8\frac{5}{20}$
29400 ,, 33400	x	—	3	1	1	42	$37\frac{2}{20}$	$119\frac{3}{4}$	$13\frac{1}{2}$	$15\frac{3}{20}$	$6\frac{3}{4}$	9
33400 ,, 37200	y	—	3	1	1	45	$39\frac{5}{20}$	$128\frac{1}{4}$	$15\frac{1}{4}$	$16\frac{14}{20}$	$7\frac{1}{2}$	$9\frac{13}{20}$
37200 ,, 40800	z	—	3	1	1	48	$41\frac{2}{20}$	137	17	$18\frac{5}{20}$	$8\frac{1}{2}$	$10\frac{12}{20}$

CHAIN CABLES, HAWSERS, &c.

Numbers for IRON AND STEEL Vessels. See Note (a)	STUD-CHAIN CABLES (e) (f) (h). Length.	Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight.			STREAM, CHAIN OR STEEL WIRE (e) (g). Length.	CHAIN. Size.	Minimum Weight. Stud Link.			Short Link.			STEEL WIRE (i) Size.	Breaking Test.	TOWLINE: HEMP OR STEEL WIRE (i) Length.	HEMP. Size.	STEEL WIRE. Size.	Breaking Test.	HAWSERS AND WARPS 90 fathoms of each.		GROSS TONNAGE LESS CREW SPACE. See Note†	Letters for Equipment as inserted in Register Book. Column 8.	Numbers for IRON AND STEEL Vessels. See Note (a).
	Fathoms.	Inches.	Tons.	Tons.	Cwts.	qrs.	lbs.	Fathoms.	Inches.	Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Inches.	Tons.	Fathoms.	Inches.	Inches.	Tons	Ins	Ins.	Tons.		
1900 and under 2500	120	$\frac{11}{16}$	$8\frac{5}{10}$	$12\frac{3}{4}$	29	0	14	45	$\frac{7}{16}$	5	1	0	5	3	0	—	—	75	5	$1\frac{3}{4}$	$5\frac{1}{2}$	3	—	50 and under 75	a	1900 and under 2500
2500 ,, 3100	120	$\frac{12}{16}$	$10\frac{1}{8}$	$15\frac{1}{8}$	34	2	7	45	$\frac{8}{16}$	6	2	0	7	1	0	—	—	75	$5\frac{1}{2}$	2	7	3	—	75 ,, 100	b	2500 ,, 3100
3100 ,, 3650	135	$\frac{13}{16}$	$11\frac{7}{8}$	$17\frac{8}{10}$	45	3	3	45	$\frac{8}{16}$	6	2	0	7	1	0	—	—	75	$5\frac{1}{2}$	2	7	3	—	100 ,, 125	c	3100 ,, 3650
3650 ,, 4200	165	$\frac{14}{16}$	$13\frac{3}{4}$	$20\frac{5}{8}$	64	1	11	45	$\frac{8}{16}$	6	2	0	7	1	0	—	—	75	6	$2\frac{1}{4}$	$9\frac{1}{2}$	$3\frac{1}{2}$	—	125 ,, 150	d	3650 ,, 4200
4200 ,, 4700	165	$\frac{15}{16}$	$15\frac{8}{10}$	$23\frac{7}{10}$	74	1	26	45	$\frac{9}{16}$	8	0	0	8	3	0	2	7	75	$6\frac{1}{2}$	$2\frac{1}{4}$	$9\frac{1}{2}$	4	—	150 ,, 175	e	4200 ,, 4700
4700 ,, 5150	165	1	18	27	84	0	17	45	$\frac{9}{16}$	8	0	0	8	3	0	2	7	75	$6\frac{1}{2}$	$2\frac{1}{4}$	$9\frac{1}{2}$	4	—	175 ,, 200	f	4700 ,, 5150
5150 ,, 6000	165	$1\frac{1}{16}$	$20\frac{3}{10}$	$30\frac{4}{10}$	95	1	9	45	$\frac{10}{16}$	9	3	0	10	2	0	$2\frac{1}{4}$	$9\frac{1}{2}$	75	7	$2\frac{1}{2}$	$12\frac{1}{2}$	4	—	200 ,, 250	g	5150 ,, 6000
6000 ,, 6800	195	$1\frac{2}{16}$	$22\frac{3}{4}$	$34\frac{1}{8}$	126	1	0	45	$\frac{10}{16}$	9	3	0	10	2	0	$2\frac{1}{4}$	$9\frac{1}{2}$	75	$7\frac{1}{2}$	$2\frac{1}{2}$	$12\frac{1}{2}$	5	—	250 ,, 300	h	6000 ,, 6800
6800 ,, 7550	195	$1\frac{3}{16}$	$25\frac{3}{8}$	38	141	0	16	60	$\frac{11}{16}$	14	2	7	15	3	7	$2\frac{3}{4}$	$15\frac{1}{2}$	75	8	$2\frac{3}{4}$	$15\frac{1}{2}$	$5\frac{1}{2}$	—	300 ,, 350	i	6800 ,, 7550
7550 ,, 8250	210	$1\frac{4}{16}$	$28\frac{1}{8}$	$42\frac{1}{8}$	168	0	0	60	$\frac{11}{16}$	14	2	7	15	3	7	$2\frac{3}{4}$	$15\frac{1}{2}$	75	8	$2\frac{3}{4}$	$15\frac{1}{2}$	$5\frac{1}{2}$	—	350 ,, 400	j	7550 ,, 8250
8250 ,, 8900	210	$1\frac{5}{16}$	31	$46\frac{1}{2}$	185	2	12	60	$\frac{12}{16}$	17	1	3	18	3	3	$2\frac{3}{4}$	$15\frac{1}{2}$	75	$8\frac{1}{2}$	$2\frac{3}{4}$	$15\frac{1}{2}$	6	—	400 ,, 450	k	8250 ,, 8900
8900 ,, 9600	240	$1\frac{6}{16}$	34	51	232	0	21	60	$\frac{12}{16}$	17	1	3	18	3	3	$2\frac{3}{4}$	$15\frac{1}{2}$	75	9	3	18	$6\frac{1}{2}$	—	450 ,, 500	l	8900 ,, 9600
9600 ,, 10800	240	$1\frac{7}{16}$	$37\frac{1}{8}$	$55\frac{5}{8}$	254	0	19	60	$\frac{13}{16}$	20	1	11	22	0	11	3	18	75	$9\frac{1}{2}$	$3\frac{1}{4}$	22	7	—	500 ,, 600	m	9600 ,, 10800
10800 ,, 12000	240	$1\frac{8}{16}$	$40\frac{5}{10}$	$58\frac{7}{10}$	276	2	14	60	$\frac{13}{16}$	20	1	11	22	0	11	3	18	90	10	$3\frac{1}{4}$	22	7	4	600 ,, 700	n	10800 ,, 12000
12000 ,, 13200	270	$1\frac{9}{16}$	$43\frac{9}{10}$	$61\frac{4}{10}$	336	0	0	60	$\frac{14}{16}$	23	1	17	25	1	17	$3\frac{1}{4}$	22	90	10	$3\frac{1}{4}$	22	8	5	700 ,, 800	o	12000 ,, 13200
13200 ,, 14400	270	$1\frac{10}{16}$	$47\frac{5}{10}$	$66\frac{5}{10}$	359	1	9	75	$\frac{14}{16}$	29	1	0	31	2	0	$3\frac{1}{4}$	22	90	10	$3\frac{1}{4}$	22	8	5	800 ,, 900	p	13200 ,, 14400
14400 ,, 15500	270	$1\frac{11}{16}$	$51\frac{1}{4}$	$71\frac{3}{4}$	387	3	4	75	$\frac{15}{16}$	33	3	11	36	1	11	$3\frac{1}{2}$	26	90	$10\frac{1}{2}$	$3\frac{1}{4}$	22	9	$5\frac{1}{2}$	900 ,, 1000	q	14400 ,, 15500
15500 ,, 17600	270	$1\frac{12}{16}$	$55\frac{1}{8}$	$77\frac{1}{8}$	416	3	0	75	$\frac{15}{16}$	33	3	11	36	1	11	$3\frac{1}{2}$	26	90	$10\frac{1}{2}$	$3\frac{1}{4}$	22	9	$5\frac{1}{2}$	1000 ,, 1200	r	15500 ,, 17600
17600 ,, 19600	270	$1\frac{13}{16}$	$59\frac{1}{8}$	$82\frac{3}{4}$	447	2	3	75	1	38	1	0	41	1	0	$3\frac{3}{4}$	29	90	11	$3\frac{1}{2}$	26	$9\frac{1}{2}$	6	1200 ,, 1400	s	17600 ,, 19600
19600 ,, 21600	270	$1\frac{14}{16}$	$63\frac{1}{4}$	$88\frac{5}{10}$	478	1	18	75	1	38	1	0	41	1	0	$3\frac{3}{4}$	29	90	11	$3\frac{1}{2}$	26	10	6	1400 ,, 1600	t	19600 ,, 21600
21600 ,, 23400	270	$1\frac{15}{16}$	$67\frac{5}{10}$	$94\frac{5}{10}$	511	1	14	75	$1\frac{1}{16}$	43	1	9	46	1	9	4	33	90	11	$3\frac{1}{2}$	26	$10\frac{1}{2}$	$6\frac{1}{2}$	—	u	21600 ,, 23400
23400 ,, 25100	270	2	72	$100\frac{8}{10}$	538	3	0	75	$1\frac{1}{16}$	43	1	9	46	1	9	4	33	90	12	4	33	11	7	—	v	23400 ,, 25100
25100 ,, 29400	270	$2\frac{1}{16}$	$76\frac{5}{10}$	$107\frac{1}{10}$	573	2	14	100	$1\frac{2}{16}$	64	2	27	68	0	27	$4\frac{1}{4}$	35	90	12	4	33	11	7	—	w	25100 ,, 29400
29400 ,, 33400	300	$2\frac{3}{16}$	$86\frac{1}{8}$	$120\frac{5}{10}$	717	2	0	120	$1\frac{2}{16}$	77	2	21	83	1	21	$4\frac{1}{4}$	35	90	13	$4\frac{1}{2}$	39	12	8	—	x	29400 ,, 33400
33400 ,, 37200	300	$2\frac{5}{16}$	$96\frac{1}{4}$	$134\frac{3}{4}$	800	3	14	120	$1\frac{3}{16}$	86	3	12	93	0	12	$4\frac{1}{2}$	39	90	13	$4\frac{1}{2}$	39	12	8	—	y	33400 ,, 37200
37200 ,, 40800	300	$2\frac{6}{16}$	$101\frac{1}{2}$	$142\frac{1}{10}$	844	1	0	120	$1\frac{4}{16}$	96	0	0	103	0	0	$4\frac{3}{4}$	47	120	14	$4\frac{3}{4}$	47	13	9	—	z	37200 ,, 40800

Lloyd's Register of British and Foreign Shipping, London,
14th December, 1899.

For Equipmennt of Trawlers and Tugs, also for Notes, see other side.

Equipment for SAILING AND STEAM TRAWLERS AND TUGS.†

Registered U.D. Tonnage. Sailing Trawlers.	Registered U.D. Tonnage. Steam Trawlers and Tugs.†	Plating Number for Iron and Steel Steam Trawlers and Tugs.†	Anchors. No.	Anchors. 1st.	Anchors. 2nd.	Anchors. 3rd.	Chain (e) (h). Length	Chain. Diameter.	Minimum Weight. Stud Link. Cwts.	qrs.	lbs.	Short Link. Cwts.	qrs.	lbs.	Hawsers. Length	Hawsers. Size.	Warps. Length	Warps. Size.
				Cwts. ex. Stock.	Cwts. ex. Stock.	Cwts. ex. Stock.	Fathms.	Ins.	Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Fathms.	Ins.	Fathms.	Ins.
50 and under 65	65 and under 80	2450 and under 2800	3	3	3	$1\frac{3}{4}$	60	$\frac{12}{16}$	17	1	3	18	3	3	60	5	60	$2\frac{1}{2}$
65 ,, 80	80 ,, 100	2800 ,, 3250	3	$3\frac{1}{2}$	$3\frac{1}{2}$	2	60	$\frac{13}{16}$	20	1	11	22	0	11	60	$5\frac{1}{2}$	60	3
80 ,, 100	100 ,, 120	3250 ,, 3650	3	4	4	$2\frac{1}{4}$	60	$\frac{14}{16}$	23	1	17	25	1	17	60	$5\frac{1}{2}$	60	3
100 ,, 120	120 ,, 140	3650 ,, 4000	3	$4\frac{1}{4}$	4	$2\frac{1}{2}$	60	$\frac{14}{16}$	23	1	17	25	1	17	60	$5\frac{1}{2}$	60	$3\frac{1}{2}$
120 ,, 140	140 ,, 160	4000 ,, 4350	3	$4\frac{1}{2}$	4	$2\frac{1}{2}$	75	$\frac{15}{16}$	33	3	11	36	1	11	60	$5\frac{1}{2}$	60	$3\frac{1}{2}$
—	—	4350 ,, 4700	3	$4\frac{3}{4}$	$4\frac{1}{4}$	$2\frac{1}{2}$	90	$\frac{15}{16}$	40	2	13	43	2	13	60	$5\frac{1}{2}$	60	4
—	—	4700 ,, 5000	3	5	$4\frac{1}{2}$	$2\frac{1}{2}$	90	1	45	3	17	49	2	0	60	$5\frac{1}{2}$	60	4
—	—	5000 ,, 5300	3	$5\frac{1}{4}$	$4\frac{3}{4}$	$2\frac{1}{2}$	90	1	45	3	17	49	2	0	60	6	60	$4\frac{1}{2}$
—	—	5300 ,, 5600	3	$5\frac{1}{2}$	5	$2\frac{3}{4}$	105	$1\frac{1}{16}$	60	2	18	64	3	12	60	6	60	$4\frac{1}{2}$
—	—	5600 ,, 5900	3	$5\frac{3}{4}$	$5\frac{1}{4}$	3	105	$1\frac{1}{16}$	60	2	18	64	3	12	60	6	60	5
—	—	5900 ,, 6200	3	6	$5\frac{1}{2}$	3	120	$1\frac{2}{16}$	77	2	21	83	1	21	60	6	60	5
—	—	6200 ,, 6500	3	$6\frac{1}{4}$	$5\frac{3}{4}$	$3\frac{1}{4}$	120	$1\frac{2}{16}$	77	2	21	83	1	21	60	6	60	5
—	—	6500 ,, 6900	3	$6\frac{1}{2}$	6	$3\frac{1}{4}$	120	$1\frac{2}{16}$	77	2	21	83	1	21	60	6	60	5
—	—	6900 ,, 7300	3	$6\frac{3}{4}$	$6\frac{1}{4}$	$3\frac{1}{2}$	120	$1\frac{3}{16}$	86	3	12	93	0	12	60	7	60	5

† The equipment for Tug Steamers of a larger size than the Trawlers provided for by the above Table shall be the same as for ordinary seagoing vessels.
The Anchors and Chains to be tested at a Public Testing Machine in accordance with the statutory tests.

London, 26th April, 1906.

*The tests of anchors in this Table are approximate tests: or as near the Statutory tests as can be expressed in tons and aliquot parts of tons.

(a) By Section 39 of the Rules for the Building and Classification of *Steel Vessels*, it is provided that "The equipment is to be regulated by the *Number* produced by the sum of the measurements of the half-moulded breadth of the vessel at the middle of the length, the depth from the upper part of keel to the top of the upper-deck beams, with the normal round-up, and the girth of the half-midship frame section of the vessel, measured from the centre line at top of keel to the upper deck stringer plate, multiplied by the length of the vessel, for a one, two, and three-decked vessel, and for a spar decked vessel."

For a sailing vessel with a poop, bridge-house, top-gallant forecastle, or a raised quarter-deck, the equipment number is to be increased *one-fifteenth* beyond that which it would be if she were flush-decked.

(b) In order to meet the requirements of different trades, the weights of Anchors as given in the Table may be modified as under:—

Where two Bower Anchors only are required, one of them may be $7\frac{1}{2}$ per cent. lighter than the weight set forth in the Table, provided the collective weight of the two Anchors is equal to that given in the Table.

Where three Bower Anchors are required, one of them may be 15 per cent., and another $7\frac{1}{2}$ per cent. lighter than the weight set forth in the Table, provided the collective weight of the three Anchors is equal to that given in the Table, but in no case may the best Bower Anchor be lighter than prescribed in the Table, nor the third Bower be lighter than is allowed by this footnote.

All Anchor Stocks must be of acknowledged and approved description, and be one-fourth the weight of the anchor given in the Table.

(d) All Anchors, including Stream and Kedge Anchors, exceeding 168 lbs. in weight, including Stock, to be tested according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(e) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(f) There should be included in the weights, 2 End Shackles to each Cable; that is 4 for each outfit which contains two Cables.

(g) There should be included in the weights, 2 End Shackles to each Stream Chain.

(h) Unstudded close-link Chains will be admitted as Cables, if proved to *two-thirds* the Test required for Stud-link Chains, for the *tensile* strain, and 100 per cent. above the *tensile* strain for the *breaking* strain.

(i) When steel wire Towlines or Hawsers are adopted, see notes (i) below.

Where a departure from the requirements of this Table is proposed by an Owner, the same should be submitted in the first place for the consideration of the Committee.

Lloyd's Register of British and Foreign Shipping, London,
22nd June, 1905.

(i) STEEL WIRE TOWLINES, HAWSERS AND WARPS.

(i) When steel wire towlines, hawsers, or warps are adopted, a short length of each of the wires composing the to-line, &c., will be required, after being galvanised, to withstand a tensile stress equivalent to that set forth in Table 22 and the aggregate strength of the wires must not be less than tn per cent. in excess of that stress.

Each wire will be required to be capable of being twisted around itself not less than eight times, and of being utwisted and straightened without breaking.

Each manufacturer to be required to provide on his premises machines suitable for satisfactorily making the fœgoing tests, and the works to be at all times open to the inspection of the Society's Surveyors, who are to be empowered to retest any hawser or towline for which a certificate has been issed by the manufacturer.

Printed Forms of Certificates, approved by the Committee, to be given by the Manufacturers of Steel Wire Hawers, will be supplied to them upon application to the Secretary.

20th December, 1883.

SPECIAL FLEXIBLE STEEL WIRE ROPE.

When an Owner prefers to substitute special flexible steel wire ropes for steel wire rope of ordinary make, the sizes may be reduced in accordance with the following table, provided each flexible rope be formed of six strands with 24 wires in each strand, and that the diameter of each wire is $\frac{1}{58}$th of he circumference of the rope, and the ropes are capable of withstanding the breaking tests shown in the table:

Flexible Steel Wire Rope. Size.	Breaking Test.	Corresponding Sizes required by Table 22.	Flexible Steel Wire Rope. Size.	Breaking Test.	Corresponding Sizes required by Table 22.
Inches.	Tons.	Inches.	Inches.	Tons.	Inches.
$1\frac{3}{4}$	8·9	2	$3\frac{1}{2}$	35·5	$4\frac{1}{4}$
2	11·7	$2\frac{1}{4}$	$3\frac{3}{4}$	41·0	$4\frac{1}{2}$
$2\frac{1}{2}$	18·2	$2\frac{3}{4}$	$4\frac{1}{4}$	52·5	$4\frac{3}{4}$
$2\frac{1}{2}$	18·2	3	$4\frac{1}{2}$	59·0	5
$2\frac{3}{4}$	22·0	$3\frac{1}{4}$	$4\frac{3}{4}$	65·5	$5\frac{1}{4}$
3	26·2	$3\frac{1}{2}$	5	73·0	$5\frac{1}{2}$
$3\frac{1}{4}$	30·7	$3\frac{3}{4}$	$5\frac{1}{2}$	88·0	6
$3\frac{1}{2}$	35·5	4	6	114·0	7

15th December, 1898.

RENEWAL OF CHAIN CABLES WHEN WORN.

When any length of a chain cable is worn so that the mean diameter at its most worn part is reduced to the size givenn in the following Table it is to be renewed.

Size of Chain Cable originally.	Should be renewed when worn to	Size of Chain Cable originally.	Should be renewed when worn to	Size of Chain Cable originally.	Should be renewed when worn to	StSize of Chain Catable originally.	Should be renewed when worn to
Diameter in inches.	Mean diameter in inches.	Diameter in inches.	Mean diameter in inches.	Diameter in inches.	Mean diameter in inches.	Diameter in inches.	Mean diameter in inches.
$\frac{11}{16}$	[illegible]	$1\frac{4}{16}$	$1\frac{2}{16}$	$1\frac{13}{16}$	$1\frac{10}{16}$	$2\frac{6}{16}$	$2\frac{2}{16}$
$\frac{12}{16}$	$\frac{21}{32}$	$1\frac{5}{16}$	$1\frac{3}{16}$	$1\frac{14}{16}$	$1\frac{11}{16}$	$2\frac{7}{16}$	$2\frac{3}{16}$
$\frac{13}{16}$	$\frac{23}{32}$	$1\frac{6}{16}$	$1\frac{7}{32}$	$1\frac{15}{16}$	$1\frac{23}{32}$	$2\frac{8}{16}$	$2\frac{4}{16}$
$\frac{14}{16}$	$\frac{25}{32}$	$1\frac{7}{16}$	$1\frac{9}{32}$	2	$1\frac{25}{32}$	$2\frac{9}{16}$	$2\frac{9}{32}$
$\frac{15}{16}$	$\frac{27}{32}$	$1\frac{8}{16}$	$1\frac{11}{32}$	$2\frac{1}{16}$	$1\frac{27}{32}$	$2\frac{10}{16}$	$2\frac{11}{32}$
1	$\frac{29}{32}$	$1\frac{9}{16}$	$1\frac{13}{32}$	$2\frac{2}{16}$	$1\frac{29}{32}$	$2\frac{11}{16}$	$2\frac{13}{32}$
$1\frac{1}{16}$	$\frac{15}{16}$	$1\frac{10}{16}$	$1\frac{15}{32}$	$2\frac{3}{16}$	$1\frac{31}{32}$	$2\frac{12}{16}$	$2\frac{15}{32}$
$1\frac{2}{16}$	1	$1\frac{11}{16}$	$1\frac{8}{16}$	$2\frac{4}{16}$	2	$2\frac{13}{16}$	$2\frac{17}{32}$
$1\frac{3}{16}$	$1\frac{1}{16}$	$1\frac{12}{16}$	$1\frac{9}{16}$	$2\frac{5}{16}$	$2\frac{1}{16}$	$2\frac{14}{16}$	$2\frac{9}{16}$

17th December, 1903.

Extract from the Rules, Section 32.

Tonnage for Regulating the Scantlings and Equipment (as regards Anchors, Chains, &c.) of Wood and Composite Vessels.

In flush-decked vessels having either one, two or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels*, is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

† In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, or awning-deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then* the *difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment.

PROVING ESTABLISHMENTS.

The following Proving Establishments are recognised by the Committee of Lloyd's Register for the Testing of Anchors and Chains while licensed by the Board of Trade for that purpose—

NETHERTON—Lloyd's Proving House ....Superintendent, Mr. H. Green.
TIPTON—Lloyd's Proving House .... ditto Mr. C. E. Perrins.
LOW WALKER—Lloyd's Proving House .... ditto Mr. S. C. Paul.
CHESTER (Saltney)—Lloyd's Proving House .... ditto Mr. H. T. Welford.
GLASGOW—Lloyd's Proving House .... ditto Mr. E. Seedhouse.
CARDIFF—Lloyd's Proving House .... ditto Mr. G. W. Penn.
SUNDERLAND—Lloyd's Proving House .... ditto Mr. W. J. Relf.
CRADLEY HEATH—Lloyd's Proving House .... ditto Mr. T. H. Dudley.

N.B. — Vessels supplied with Anchors and Chain Cables tested at any of the Proving Establishments in the above list, will have the notation of "Lloyd'sA.&C.P." in the Register Book, signifying that the Anchors and Chain Cables have been tested at a machine under the control of the Committee of Lloyd's Register of Shipping.

The following Machines have been recognised by the Committee for the testing of Anchors and Chain Cables supplied to foreign owned vessels (*see* Section 39 of the Rules.)

AUSTRIA .... Government Establishment at Pola.
,, ... F. F. von Helldorf & Otto Rothart, Bruckl.
BELGIUM .... Société Anonyme des Fabriques de Chaines & Pièces de Forge de Heppignies, près Fleurus.
,, ... Société Anonyme des Usines Wattelar-Francq, Roux.
,, ... Société Générale du Laminage Annulaire pour la Fabrication de Chaines sans soudre, Brussels.
DENMARK .... Government Establishment at Copenhagen.
FRANCE .... E. Turbot, Anzin (Nord).
,, ... Chantiers de la Loire, Nantes.
,, ... Vve. E. Couillard, Succr., Havre.
,, ... Dorémieux, Fils et Cie., St. Amand (Nord).
,, ... E. Davaine, St. Amand (Nord).
,, ... Marrel Frères, Capelette, Marseilles.
,, ... M. Mordelet, Havre.
GERMANY .... Hochfelder Walzwerk, Aktien Verein, Duisburg.
HOLLAND .... Koninklijke Nederlandsche Grofsmederij, Leiden.
SWEDEN .... Government Establishment at Kongl. Tekniska Högskolan, Stockholm.
UNITED STATES......... American Steel Casting Co., Chester, Pa. (for the testing of Anchors only).
,, ,, ... Baldt Anchor Co., Chester, Pa. (for the testing of Anchors only).
,, ,, ... Bradlee & Co.'s Works, Philadelphia, Pa.
,, ,, ... Cape Ann Anchor Works, Gloucester, Mass.
,, ,, ... J. B. Carr Co., Troy, N.Y.
,, ,, ... Columbus Chain Co., Columbus, Ohio.
,, ,, ... Frankford Chain Works, Frankford, Philadelphia, Pa.
,, ,, ... Hayden-Corbett & Co., Columbus, Ohio.
,, ,, ... Lebanon Chain Works, Lebanon, Pa.
,, ,, ... The Logan Iron and Steel Co., Burnham, Pa.
,, ,, ... J. McKay & Co.'s Iron City Chain Works, McKees Rocks, near Pittsburg, Pa.
,, ,, ... Monongahela Iron and Steel Co., Pittsburg, Pa.
,, ,, ... The Seaboard Steel Castings Co., Chester, Pa. (for the testing of Anchors only).
,, ,, ... Seneca Chain Co., Kent, Ohio.
,, ,, ... West End Rolling Mills, Lebanon, Pa.
,, ,, ... Whitehill Chain Works, Whitehill, Fieldsboro, N.J.
,, ,, ... Woodhouse Chain Works, Trenton, N.J.

By order of the Committee,
ANDREW SCOTT,
Secretary.

London, April, 1906.

Table of Minimum Dimensions of FRAMES,

NUMBERS. For Frames, Reversed Frames Bulkheads, & Pillars (*See Section 2.*)	SPACING OF FRAMES. *	FRAMES. Dimensions of angles for three-fifths the length of vessel amidships, and bulkheads.	FRAMES. Dimensions of angles before and abaft the three-fifths length.	Reversed Frames. Dimensions of Reversed angles all fore and aft.	Dimensions of Z and Channel bar Frames for three-fifths length amidships. †	Dimensions of Bulb Angle Frames for three-fifths length amidships.
	ins.	inches.	inches.	inches.	inches.	inches.
31 and under 37	20	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{4} \times 2\frac{1}{4} \times \frac{5}{20}$	...	...
37 and under 45	21	$3 \times 2\frac{1}{2} \times \frac{5}{20}$	$3 \times 2\frac{1}{2} \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	...	...
45 and under 52	21	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{5}{20}$	$2\frac{1}{2} \times 2\frac{1}{2} \times \frac{5}{20}$	...	...
52 and under 57	22	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3\frac{1}{2} \times 3 \times \frac{5}{20}$	$3 \times 2\frac{1}{2} \times \frac{5}{20}$	$3\frac{1}{2} \times 3 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{8}{20}$
57 and under 61	22	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 2\frac{1}{2} \times \frac{6}{20}$	$3\frac{1}{2} \times 3 \times 3 \times \frac{8}{20}$	$4\frac{1}{2} \times 3 \times \frac{9}{20}$
61 and under 65	23	$4 \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$4 \times 3 \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{9}{20}$
65 and under 68	23	$4 \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$	$4 \times 3 \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{9}{20}$
68 and under 71	23	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{9}{20}$
71 and under 73	24	$4\frac{1}{2} \times 3 \times \frac{8}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times 3 \times \frac{9}{20}$	$5\frac{1}{2} \times 3 \times \frac{10}{20}$
73 and under 76	24	$5 \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$5 \times 3 \times 3 \times \frac{9}{20}$	$6 \times 3 \times \frac{10}{20}$
76 and under 80	24	$5 \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{7}{20}$	$3\frac{1}{2} \times 3 \times \frac{8}{20}$	$5 \times 3 \times 3 \times \frac{10}{20}$	$6 \times 3 \times \frac{11}{20}$
80 and under 85	24	$5 \times 3\frac{1}{2} \times \frac{8}{20}$	$5 \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$5 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$6 \times 3\frac{1}{2} \times \frac{11}{20}$
85 and under 91	24	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$4 \times 3\frac{1}{2} \times \frac{8}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$
91 and under 97	24	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$4 \times 3\frac{1}{2} \times \frac{9}{20}$	$5\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$
97 and under 103	25	$6 \times 3\frac{1}{2} \times \frac{10}{20}$	$6 \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$6 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$7 \times 3\frac{1}{2} \times \frac{13}{20}$
103 and under 109	25	$6 \times 3\frac{1}{2} \times \frac{10}{20}$	$6 \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$7\frac{1}{2} \times 3\frac{1}{2} \times \frac{13}{20}$
109 and under 115	26	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 4 \times \frac{10}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$8 \times 3\frac{1}{2} \times \frac{13}{20}$
115 and under 122	26	$7 \times 3\frac{1}{2} \times \frac{10}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$4\frac{1}{2} \times 4 \times \frac{10}{20}$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$8\frac{1}{2} \times 3\frac{1}{2} \times \frac{13}{20}$
122 and under 130	27	$7 \times 3\frac{1}{2} \times \frac{11}{20}$	$6\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$4\frac{1}{2} \times 4 \times \frac{10}{20}$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{13}{20}$	$8\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$

* Wider spacing than the above may be adopted provided the framing and plating be increased to the satisfaction of the Committee.

† The thickness given for Z and Channel bar frames is to be the minimum thickness of both webs and flanges.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.—*17th December, 1903.*

DEEP FRAMING. (*See Section 14b.*) DEPTH OF GIRDER. ‡ Two deck, Awning deck and Spar deck vessels.	Three deck vessels.	Bulkheads. Lower Half.	Upper Half
inches.	inches.	inches.	inches.
...	...	$\frac{5}{20}$	$\frac{5}{20}$
...	...	$\frac{5}{20}$	$\frac{5}{20}$
...	...	$\frac{5}{20}$	$\frac{5}{20}$
$4\frac{1}{2}$	...	$\frac{6}{20}$	$\frac{5}{20}$
5	...	$\frac{6}{20}$	$\frac{5}{20}$
6	...	$\frac{6}{20}$	$\frac{6}{20}$
$6\frac{1}{2}$	...	$\frac{6}{20}$	$\frac{6}{20}$
7	$6\frac{1}{2}$	$\frac{6}{20}$	$\frac{6}{20}$
$7\frac{1}{2}$	7	$\frac{6}{20}$	$\frac{6}{20}$
8	$7\frac{1}{2}$	$\frac{6}{20}$	$\frac{6}{20}$
$8\frac{1}{2}$	8	$\frac{7}{20}$	$\frac{6}{20}$
9	$8\frac{1}{2}$	$\frac{7}{20}$	$\frac{6}{20}$
$9\frac{1}{2}$	9	$\frac{7}{20}$	$\frac{6}{20}$
10	$9\frac{1}{2}$	$\frac{7}{20}$	$\frac{6}{20}$
...	10	$\frac{8}{20}$	$\frac{7}{20}$
...	$10\frac{1}{2}$	$\frac{8}{20}$	$\frac{7}{20}$
...	...	$\frac{8}{20}$	$\frac{7}{20}$
...	...	$\frac{8}{20}$	$\frac{7}{20}$
...	...	$\frac{8}{20}$	$\frac{7}{20}$

TABLE FOR SIZES OF FLOORS.

Floor plates in engine space of steam vessels to be $\frac{1}{20}$ of an inch thicker, and in the boiler space $\frac{2}{20}$ of an inch thicker than in this Table.

NUMBERS FOR FLOORS. (*See Section 2*)	For three-fifths length amidships.	Thickness at Ends.	NUMBERS FOR FLOORS—cont. (*See Section 2.*)	For three-fifths length amidships.	Thickness at Ends.
	inches.	inches.		inches.	inches.
31 and under 32	$9 \times \frac{5}{20}$	$\frac{5}{20}$	67 and under 68	$20\frac{1}{2} \times \frac{8}{20}$	$\frac{7}{20}$
32 and under 33	$9\frac{1}{2} \times \frac{5}{20}$	$\frac{5}{20}$	68 and under 69	$21 \times \frac{8}{20}$	$\frac{7}{20}$
33 and under 34	$10 \times \frac{5}{20}$	$\frac{5}{20}$	69 and under 70	$21 \times \frac{9}{20}$	$\frac{7}{20}$
34 and under 35	$10\frac{1}{2} \times \frac{5}{20}$	$\frac{5}{20}$	70 and under 71	$21\frac{1}{2} \times \frac{9}{20}$	$\frac{7}{20}$
35 and under 37	$11 \times \frac{5}{20}$	$\frac{5}{20}$	71 and under 72	$22 \times \frac{9}{20}$	$\frac{7}{20}$
37 and under 39	$11\frac{1}{2} \times \frac{5}{20}$	$\frac{5}{20}$	72 and under 73	$22\frac{1}{2} \times \frac{9}{20}$	$\frac{7}{20}$
39 and under 41	$12 \times \frac{5}{20}$	$\frac{5}{20}$	73 and under 74	$23 \times \frac{9}{20}$	$\frac{7}{20}$
41 and under 43	$12 \times \frac{6}{20}$	$\frac{5}{20}$	74 and under 76	$23\frac{1}{2} \times \frac{9}{20}$	$\frac{7}{20}$
43 and under 45	$12\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$	76 and under 78	$24 \times \frac{9}{20}$	$\frac{7}{20}$
45 and under 47	$13 \times \frac{6}{20}$	$\frac{5}{20}$	78 and under 80	$24 \times \frac{10}{20}$	$\frac{8}{20}$
47 and under 49	$13\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$	80 and under 84	$24\frac{1}{2} \times \frac{10}{20}$	$\frac{8}{20}$
49 and under 51	$14 \times \frac{6}{20}$	$\frac{5}{20}$	84 and under 88	$25 \times \frac{10}{20}$	$\frac{8}{20}$
51 and under 52	$14\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$	88 and under 90	$26 \times \frac{10}{20}$	$\frac{8}{20}$
52 and under 53	$15 \times \frac{6}{20}$	$\frac{5}{20}$	90 and under 92	$27 \times \frac{10}{20}$	$\frac{8}{20}$
53 and under 55	$15\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$	92 and under 95	$28 \times \frac{10}{20}$	$\frac{8}{20}$
55 and under 56	$15\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$	95 and under 98	$29 \times \frac{10}{20}$	$\frac{8}{20}$
56 and under 57	$16 \times \frac{7}{20}$	$\frac{6}{20}$	98 and under 101	$30 \times \frac{10}{20}$	$\frac{8}{20}$
57 and under 58	$16\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$	101 and under 105	$31 \times \frac{10}{20}$	$\frac{8}{20}$
58 and under 59	$17 \times \frac{7}{20}$	$\frac{6}{20}$	105 and under 108	$32 \times \frac{10}{20}$	$\frac{8}{20}$
59 and under 60	$17\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$	108 and under 110	$33 \times \frac{10}{20}$	$\frac{8}{20}$
60 and under 62	$17\frac{1}{2} \times \frac{8}{20}$	$\frac{7}{20}$	110 and under 113	$34 \times \frac{10}{20}$	$\frac{8}{20}$
62 and under 63	$18 \times \frac{8}{20}$	$\frac{7}{20}$	113 and under 116	$35 \times \frac{10}{20}$	$\frac{8}{20}$
63 and under 64	$18\frac{1}{2} \times \frac{8}{20}$	$\frac{7}{20}$	116 and under 120	$36 \times \frac{10}{20}$	$\frac{8}{20}$
64 and under 65	$19 \times \frac{8}{20}$	$\frac{7}{20}$	120 and under 125	$37 \times \frac{10}{20}$	$\frac{8}{20}$
65 and under 66	$19\frac{1}{2} \times \frac{8}{20}$	$\frac{7}{20}$	125 and under 130	$38 \times \frac{10}{20}$	$\frac{8}{20}$
66 and under 67	$20 \times \frac{8}{20}$	$\frac{7}{20}$			

‡ Where Channel or ⅂ frames are fitted in lieu of deep framing formed of frames and reversed frames, the thickness is to be one-twentieth of an inch greater than given in the above Table, and where bulb angle frames are fitted the thickness is to be two-twentieths of an inch greater. The depth of framing and width of flanges are in all cases to be in accordance with the requirements of the above Table.

STEEL VESSELS.

TABLE OF MINIMUM DIAMETERS OF SOLID

LENGTH OF PILLAR.	PILLARS TO UPPER OR SPAR DECK BEAMS.													PILLARS TO MIDDLE				
	One row of Pillars.							Two rows of Pillars.			Three rows of Pillars.			One row of Pillars.				
	LENGTHS OF BEAMS AMIDSHIPS IN FEET.													LENGTHS OF BEAMS				
	15	19	23	27	31	35	39	43	47	51	55	59	63	23	27	31	35	39
Feet.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
6 and under 8	2¼	2¼	2⅜	2⅜	2½	2⅝	2¾	2⅝	2¾	2⅞	2¾	2⅞	3	2⅞	3	3⅛	3¼	3⅜
8 and under 10	2⅜	2⅜	2½	2½	2⅝	2¾	2⅞	2¾	2⅞	3	2⅞	3	3⅛	3	3⅛	3¼	3½	3⅝
10 and under 12	2½	2½	2⅝	2¾	2¾	2⅞	3	2⅞	3	3⅛				3¼	3⅜	3½	3¾	3⅞
12 and under 14	2⅝	2¾	2⅞	3	3	3⅛	3¼	3	3⅛	3¼					3⅝	3¾	4	4¼
14 and under 16		2⅞	3	3⅛	3¼	3⅜	3½	3¼	3⅜	3½						4	4¼	4½
16 and under 18			3¼	3⅜	3½	3⅝	3¾	3½	3⅝	3¾						4¼	4½	4¾
18 and under 20			3½	3⅝	3¾	3⅞	4	3¾	3⅞	4							4¾	5
20 and under 22				3¾	3⅞	4	4¼	3⅞	4	4¼							5	5¼
22 and under 24				4	4	4¼	4½	4	4¼	4½								5½
24 and under 26					4¼	4½	4¾	4¼	4½	4¾								
26 and under 28						4¾	5	4½	4¾	5								
28 and under 30							5¼	4¾	5	5¼								
30 and under 32								5	5¼	5½								
	PILLARS TO AWNING, BRIDGE, FORECASTLE, AND POOP DECK BEAMS.																	
6 and under 8	2⅛	2⅛	2¼	2¼	2⅜	2½	2⅝	2½	2⅝	2¾	2⅝	2¾	2⅞					

Lloyd's Register of British and Foreign Shipping, London.—*26th April*, 1900.

OR MAIN DECK BEAMS.						PILLARS TO LOWER DECK BEAMS.								PILLARS TO ORLOP DECK BEAMS.				LENGTH OF PILLAR.
Two rows of Pillars.			Three rows of Pillars.			One row of Pillars.		Two rows of Pillars.			Three rows of Pillars.			Two rows of Pillars.	Three rows of Pillars.			
AMIDSHIPS IN FEET.						LENGTHS OF BEAMS AMIDSHIPS IN FEET.								LENGTHS OF BEAMS AMIDSHIPS IN FEET.				
43	47	51	55	59	63	35	39	43	47	51	55	59	63	51	55	59	63	
ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	Feet.
$3\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{3}{8}$	$3\frac{1}{4}$	$3\frac{3}{8}$	$3\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{7}{8}$	$3\frac{5}{8}$	$3\frac{3}{4}$	$3\frac{7}{8}$	$3\frac{3}{4}$	$3\frac{7}{8}$	4	$4\frac{1}{4}$	4	$4\frac{1}{4}$	$4\frac{1}{4}$	6 and under 8
$3\frac{3}{8}$	$3\frac{1}{2}$	$3\frac{5}{8}$	$3\frac{1}{2}$	$3\frac{5}{8}$	$3\frac{3}{4}$	4	4	$3\frac{3}{4}$	4	4	$3\frac{7}{8}$	4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	8 and under 10
$3\frac{5}{8}$	$3\frac{3}{4}$	$3\frac{7}{8}$	$3\frac{3}{4}$			$4\frac{1}{4}$	$4\frac{1}{4}$	4	$4\frac{1}{4}$	$4\frac{1}{4}$	4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{3}{4}$	10 and under 12
$3\frac{7}{8}$	4	$4\frac{1}{4}$	4				$4\frac{1}{2}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$4\frac{3}{4}$	$4\frac{3}{4}$	5	12 and under 14
4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{4}$					$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$5\frac{1}{4}$	5	$5\frac{1}{4}$	$5\frac{1}{4}$	14 and under 16
$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{1}{4}$					$4\frac{3}{4}$	$4\frac{3}{4}$	5	$4\frac{3}{4}$	5	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{1}{2}$	16 and under 18
$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{1}{2}$						5	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{2}$		$5\frac{1}{2}$	$5\frac{3}{4}$	$5\frac{3}{4}$	18 and under 20
$4\frac{3}{4}$	5	5	$4\frac{3}{4}$						$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{3}{4}$			6	6	20 and under 22
5	$5\frac{1}{4}$	$5\frac{1}{4}$	5							$5\frac{3}{4}$	$5\frac{3}{4}$	$5\frac{3}{4}$	6					22 and under 24
$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{4}$							6	6	6	$6\frac{1}{4}$					24 and under 26
$5\frac{1}{2}$	$5\frac{3}{4}$	$5\frac{3}{4}$	$5\frac{1}{2}$								$6\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{2}$					26 and under 28
$5\frac{3}{4}$	6	6	$5\frac{3}{4}$															28 and under 30
																		30 and under 32

Pillars under wide spaced hold beams may be of the sizes required for pillars of the same length under the deck next above the hold beams.

If a middle deck is intended exclusively for the accommodation of passengers, the pillars between this deck and the floors may be a quarter of an inch less in diameter than is required by the Table, and where the lower deck is also intended for passengers exclusively, the pillars between this deck and the floors may be half an inch less in diameter than required by the Table.

For sizes of Hollow pillars *see* Table S 1B.

For scantlings of wide spaced pillars and girders at heads of same, *see* Tables S 1C and S 1D, and Sketches.

LENGTH OF PILLAR.	PILLARS TO UPPER OR SPAR DECK BEAMS.												
	One row of Pillars.							Two rows of Pillars.			Three rows of Pillars.		
	LENGTHS OF BEAMS AMIDSHIPS IN FEET.												
	15	19	23	27	31	35	39	43	47	51	55	59	63
Feet	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins
6 and under 8	2¾ × 5/16	2¾ × 5/16	3 × 5/16	3 × 5/16	3 × 6/16	3¼ × 6/16	3½ × 6/16	3¼ × 6/16	3½ × 6/16	3¾ × 6/16	3½ × 6/16	3¾ × 6/16	4 × 7/16
8 and under 10	3 × 5/16	3 × 5/16	3 × 6/16	3 × 6/16	3¼ × 6/16	3½ × 6/16	3¾ × 6/16	3½ × 6/16	3¾ × 6/16	4 × 7/16	3¾ × 6/16	4 × 7/16	4¼ × 7/16
10 and under 12	3 × 6/16	3 × 6/16	3¼ × 6/16	3½ × 6/16	3½ × 6/16	3¾ × 6/16	4 × 6/16	3¾ × 6/16	4 × 6/16	4 × 7/16			
12 and under 14	3¼ × 6/16	3½ × 6/16	3¾ × 6/16	4 × 6/16	4 × 6/16	4 × 7/16	4¼ × 7/16	4 × 6/16	4 × 7/16	4¼ × 7/16			
14 and under 16		3¾ × 6/16	4 × 6/16	4 × 7/16	4⅛ × 7/16	4¼ × 7/16	4½ × 7/16	4⅛ × 7/16	4¼ × 7/16	4½ × 7/16			
16 and under 18			4⅛ × 7/16	4¼ × 7/16	4½ × 7/16	4¾ × 7/16	5 × 7/16	4½ × 7/16	4¾ × 7/16	5 × 7/16			
18 and under 20			4¼ × 7/16	4½ × 7/16	4¾ × 7/16	5 × 7/16	5¼ × 7/16	4¾ × 7/16	5 × 7/16	5¼ × 7/16			
20 and under 22				4¾ × 7/16	5 × 7/16	5¼ × 7/16	5½ × 8/16	5 × 7/16	5¼ × 7/16	5½ × 8/16			
22 and under 24				5¼ × 7/16	5¼ × 7/16	5½ × 8/16	6 × 8/16	5¼ × 7/16	5½ × 8/16	6 × 8/16			
24 and under 26					5¼ × 7/16	5½ × 8/16	6 × 8/16	5¼ × 7/16	5½ × 8/16	6 × 8/16			
26 and under 28						6 × 8/16	6 × 9/16	5½ × 8/16	6 × 8/16	6 × 9/16			
28 and under 30							6¼ × 9/16	6 × 8/16	6 × 9/16	6¼ × 9/16			
30 and under 32								6 × 9/16	6¼ × 9/16	6¾ × 9/16			
	PILLARS TO AWNING, BRIDGE, FORECASTLE, AND POOP DECK BEAMS.												
6 and under 8	2½ × 5/16	2½ × 5/16	2¾ × 5/16	2¾ × 5/16	3 × 5/16	3 × 6/16	3¼ × 6/16	3 × 6/16	3¼ × 6/16	3½ × 6/16	3¼ × 6/16	3½ × 6/16	3¾ × 6/16

LENGTH OF PILLAR.	PILLARS TO MIDDLE				
	One row of Pillars.				
	LENGTH OF BEAMS				
	23	27	31	35	39
Feet	ins.	ins.	ins.	ins.	ins.
6 and under 8	3¾ × 6/16	4 × 7/16	4¼ × 7/16	4½ × 7/16	4¾ × 7/16
8 and under 10	4 × 7/16	4¼ × 7/16	4½ × 7/16	5 × 7/16	5½ × 7/16
10 and under 12	4¼ × 7/16	4½ × 7/16	4¾ × 7/16	5½ × 7/16	5¾ × 7/16
12 and under 14		5 × 7/16	5½ × 7/16	6 × 8/16	6 × 9/16
14 and under 16			5½ × 8/16	6 × 8/16	6 × 9/16
16 and under 18			6 × 8/16	6 × 9/16	6¼ × 9/16
18 and under 20				6 × 9/16	6¼ × 9/16
20 and under 22				6¼ × 9/16	6¾ × 9/16
22 and under 24					7 × 9/16
24 and under 26					
26 and under 28					
28 and under 30					

Pillars under wide spaced hold beams may be of t
above the hold beams.

If a middle deck is intended exclusively for the a
floors may be a quarter of an inch less in diameter
intended for passengers exclusively, the pillars betw
than required by the Table.

For sizes of solid pillars, *see* Tables S 1A.

For scantlings of wide spaced pillars and girders

OR MAIN DECK BEAMS.						PILLARS TO LOWER DECK BEAMS.								PILLARS TO ORLOP DECK BEAMS.				LENGTH OF PILLAR.
Two rows of Pillars.			Three rows of Pillars.			One row of Pillars.		Two rows of Pillars.			Three rows of Pillars.			Two rows of Pillars.	Three rows of Pillars.			
AMIDSHIPS IN FEET.						LENGTHS OF BEAMS AMIDSHIPS IN FEET.								LENGTHS OF BEAMS AMIDSHIPS IN FEET				
43	47	51	55	59	63	35	39	43	47	51	55	59	63	51	55	59	63	
$4\frac{1}{4}\times\frac{7}{16}$	$4\frac{1}{2}\times\frac{7}{16}$	$4\frac{3}{4}\times\frac{7}{16}$	$4\frac{1}{2}\times\frac{7}{16}$	$4\frac{3}{4}\times\frac{7}{16}$	$5\times\frac{7}{16}$	$5\frac{3}{4}\times\frac{8}{16}$	$6\times\frac{8}{16}$	$5\frac{1}{2}\times\frac{7}{16}$	$5\frac{3}{4}\times\frac{8}{16}$	$6\times\frac{8}{16}$	$5\frac{3}{4}\times\frac{8}{16}$	$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	6 and under 8
$4\frac{3}{4}\times\frac{7}{16}$	$5\times\frac{7}{16}$	$5\frac{1}{2}\times\frac{7}{16}$	$5\times\frac{7}{16}$	$5\frac{1}{2}\times\frac{7}{16}$	$5\frac{3}{4}\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\times\frac{9}{16}$	$5\frac{3}{4}\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\times\frac{9}{16}$	$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{2}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{2}\times\frac{9}{16}$	8 and under 10
$5\times\frac{7}{16}$	$5\frac{1}{2}\times\frac{7}{16}$	$5\frac{3}{4}\times\frac{7}{16}$	$5\frac{1}{2}\times\frac{7}{16}$			$6\times\frac{9}{16}$	$6\times\frac{9}{16}$	$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\times\frac{9}{16}$	$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{2}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{2}\times\frac{9}{16}$	10 and under 12
$5\frac{1}{2}\times\frac{7}{16}$	$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\times\frac{8}{16}$				$6\frac{1}{4}\times\frac{9}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{2}\times\frac{9}{16}$	$7\times\frac{9}{16}$	$6\frac{1}{2}\times\frac{9}{16}$	$6\frac{1}{2}\times\frac{9}{16}$	$7\times\frac{9}{16}$	12 and under 14
$5\frac{1}{2}\times\frac{8}{16}$	$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\times\frac{8}{16}$					$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$7\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$7\times\frac{9}{16}$	$7\times\frac{9}{16}$	14 and under 16
$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\times\frac{8}{16}$					$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$7\times\frac{9}{16}$	$7\frac{1}{4}\times\frac{10}{16}$	$7\times\frac{9}{16}$	$7\frac{1}{4}\times\frac{10}{16}$	$7\frac{1}{4}\times\frac{10}{16}$	16 and under 18
$6\times\frac{8}{16}$	$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\times\frac{8}{16}$						$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$7\times\frac{9}{16}$		$7\times\frac{9}{16}$	$7\frac{1}{2}\times\frac{10}{16}$	$7\frac{1}{2}\times\frac{10}{16}$	18 and under 20
$6\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$	$6\times\frac{9}{16}$						$6\frac{3}{4}\times\frac{9}{16}$	$7\times\frac{9}{16}$	$7\times\frac{9}{16}$	$7\times\frac{9}{16}$	$7\frac{1}{2}\times\frac{10}{16}$			$8\times\frac{11}{16}$	$8\times\frac{11}{16}$	20 and under 22
$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$							$7\frac{1}{2}\times\frac{10}{16}$	$7\frac{1}{2}\times\frac{10}{16}$	$7\frac{1}{2}\times\frac{10}{16}$	$8\times\frac{11}{16}$					22 and under 24
$6\frac{1}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$6\frac{3}{4}\times\frac{9}{16}$	$6\frac{1}{4}\times\frac{9}{16}$							$8\times\frac{10}{16}$	$8\times\frac{10}{16}$	$8\times\frac{10}{16}$	$8\times\frac{11}{16}$					24 and under 26
$6\frac{3}{4}\times\frac{9}{16}$	$7\frac{1}{4}\times\frac{10}{16}$	$7\frac{1}{4}\times\frac{10}{16}$	$6\frac{3}{4}\times\frac{9}{16}$								$8\times\frac{11}{16}$	$8\times\frac{11}{16}$	$8\frac{1}{2}\times\frac{11}{16}$					26 and under 28
$7\frac{1}{4}\times\frac{10}{16}$	$8\times\frac{10}{16}$	$8\times\frac{10}{16}$	$7\frac{1}{4}\times\frac{10}{16}$															28 and under 30

ne sizes required for pillars of the same length under the deck next

ccommodation of passengers, the pillars between this deck and the than is required by the Table, and where the lower deck is also een this deck and the floors may be half an inch less in diameter

at heads of same, *see* Tables S 1c and S 1d and Sketches.

Pillars made of approved weldless rolled or drawn steel tubes will be admitted of the diameter required by the above Table provided the thicknesses be as given upon the following table and that the steel of which the pillars are made has a tensile strength of not less than 35 tons per square inch with an elongation of not less than 10 per cent. in a length of 8 inches.

Thickness required by Table S1B.	$\frac{5}{16}$	$\frac{6}{16}$	$\frac{7}{16}$	$\frac{8}{16}$	$\frac{9}{16}$	$\frac{10}{16}$	$\frac{11}{16}$
Equivalent thickness of approved weldless drawn steel hollow pillars.	$\frac{8}{32}$	$\frac{9}{32}$	$\frac{10}{32}$	$\frac{12}{32}$	$\frac{13}{32}$	$\frac{15}{32}$	$\frac{16}{32}$

NUMBERS.* $\frac{S \times B \times H}{100}$	LENGTH AND					
	6 feet and under 8 feet.				8 feet and	
	TUBULAR. ○ Outside diameter.	DOUBLE CHANNELS AND FACE PLATES. ⌶ Channels.	Plates.	FOUR ANGLES. ╋	TUBULAR. ○ Outside diameter.	DOUBLE CH FACE ⌶ Channels.
	inches.	inches.	inches.	inches.	inches.	inches.
11 and under 13	$6 \times \frac{8}{20}$	$6 \times 3 \times 3 \times \frac{8}{20}$			$6 \times \frac{8}{20}$	$6 \times 3 \times 3$
13 and under 16	$6\frac{1}{2} \times \frac{8}{20}$	$6 \times 3 \times 3 \times \frac{9}{20}$			$6\frac{1}{2} \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2}$
16 and under 19	$7 \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$			$7 \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2}$
19 and under 22	$7\frac{1}{2} \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$			$7\frac{1}{2} \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2}$
22 and under 25	$8 \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$			$8 \times \frac{8}{20}$	$8 \times 4 \times 4$
25 and under 29	$8 \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{8}{20}$		$4 \times 4 \times \frac{8}{20}$	$8 \times \frac{9}{20}$	$8 \times 4 \times 4$
29 and under 33	$9 \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{9}{20}$		$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{8}{20}$	$9 \times \frac{9}{20}$	$8 \times 4 \times 4$
33 and under 37	$10 \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{10}{20}$		$5 \times 5 \times \frac{8}{20}$	$10 \times \frac{9}{20}$	$8 \times 4 \times 4$
37 and under 42	$10 \times \frac{10}{20}$	$8 \times 4 \times 4 \times \frac{11}{20}$		$5 \times 5 \times \frac{9}{20}$	$10 \times \frac{10}{20}$	$8 \times 4 \times 4$
42 and under 47	$11 \times \frac{10}{20}$	$8 \times 4 \times 4 \times \frac{12}{20}$		$5 \times 5 \times \frac{10}{20}$	$11 \times \frac{10}{20}$	$8 \times 4 \times 4$
47 and under 52	$12 \times \frac{10}{20}$	$8 \times 4 \times 4 \times \frac{13}{20}$		$5 \times 5 \times \frac{11}{20}$	$12 \times \frac{10}{20}$	$8 \times 4 \times 4$
52 and under 58	$12 \times \frac{11}{20}$	$8 \times 4 \times 4 \times \frac{14}{20}$		$5 \times 5 \times \frac{12}{20}$	$12 \times \frac{11}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2}$
58 and under 64	$13 \times \frac{11}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	$13 \times \frac{11}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2}$
64 and under 71	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2}$
71 and under 78	$14 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	$14 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2}$
78 and under 86	$15 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	$15 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2}$
86 and under 94	$16 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{14}{20}$	$16 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2}$
94 and under 102	$17 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{13}{20}$	$6 \times 6 \times \frac{15}{20}$	$17 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2}$
102 and under 110	$18 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$13 \times \frac{14}{20}$	$7 \times 7 \times \frac{13}{20}$	$18 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2}$
110 and under 118	$18 \times \frac{13}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{15}{20}$	$7 \times 7 \times \frac{14}{20}$	$18 \times \frac{13}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2}$
118 and under 126	$18 \times \frac{14}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{16}{20}$	$7 \times 7 \times \frac{15}{20}$	$18 \times \frac{14}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2}$
126 and under 134	$18 \times \frac{15}{20}$			$7 \times 7 \times \frac{16}{20}$	$18 \times \frac{15}{20}$	

1. * S is the fore and aft distance in feet from centre of span to centre of span.
B is one-third the breadth of vessel in feet at the deck at the head of the pillars, where two rows of pillars are
H is the sum of the heights of the several 'tween decks in feet from top of beam to top of beam above the poop, bridge or forecastle deck.
In the case of a deck fitted exclusively for the accommodation of passengers, the height of 'tween decks may

(For 12 feet and above, see continuation.)

FORM OF PILLAR.							NUMBERS.* $\frac{S \times B \times H}{100}$
under 10 feet.			10 feet and under 12 feet.				
…NNELS AND …LATES.		FOUR ANGLES.	TUBULAR.	DOUBLE CHANNELS AND FACE PLATES.		FOUR ANGLES.	
	Plates.		Out-side diameter.	Channels.	Plates.		
	inches.	inches.	inches.	inches.	inches.	inches.	
$\times \frac{9}{20}$			$6\frac{1}{2} \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$			11 and under 13
$\times \frac{8}{20}$			$7 \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$			13 and under 16
$\times \frac{9}{20}$			$7\frac{1}{2} \times \frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$			16 and under 19
$\times \frac{10}{20}$		$4 \times 4 \times \frac{8}{20}$	$8 \times \frac{8}{20}$	$8 \times 4 \times 4 \times \frac{9}{20}$		$4 \times 4 \times \frac{9}{20}$	19 and under 22
$\times \frac{9}{20}$		$4 \times 4 \times \frac{9}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$8 \times 4 \times 4 \times \frac{10}{20}$		$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{8}{20}$	22 and under 25
$\times \frac{9}{20}$		$4 \times 4 \times \frac{9}{20}$	$8\frac{1}{2} \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{10}{20}$		$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{8}{20}$	25 and under 29
$\times \frac{10}{20}$		$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{8}{20}$	$9 \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{11}{20}$		$5 \times 5 \times \frac{8}{20}$	29 and under 33
$\times \frac{11}{20}$		$5 \times 5 \times \frac{8}{20}$	$10 \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{12}{20}$		$5 \times 5 \times \frac{9}{20}$	33 and under 37
$\times \frac{12}{20}$		$5 \times 5 \times \frac{9}{20}$	$10 \times \frac{10}{20}$	$8 \times 4 \times 4 \times \frac{13}{20}$		$5 \times 5 \times \frac{10}{20}$	37 and under 42
$\times \frac{13}{20}$		$5 \times 5 \times \frac{10}{20}$	$11 \times \frac{10}{20}$	$8 \times 4 \times 4 \times \frac{14}{20}$		$5 \times 5 \times \frac{11}{20}$	42 and under 47
$\times \frac{14}{20}$		$5 \times 5 \times \frac{11}{20}$	$12 \times \frac{10}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{12}{20}$	47 and under 52
$\frac{8}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{12}{20}$	$12 \times \frac{11}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	52 and under 58
$\frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	$13 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	58 and under 64
$\frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	64 and under 71
$\frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	$14 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	71 and under 78
$\frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	$15 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{14}{20}$	78 and under 86
$\frac{10}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{14}{20}$	$16 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{13}{20}$	$6 \times 6 \times \frac{15}{20}$	86 and under 94
$\frac{10}{20}$	$12 \times \frac{13}{20}$	$6 \times 6 \times \frac{15}{20}$	$17 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{15}{20}$	$6 \times 6 \times \frac{16}{20}$	94 and under 102
$\frac{9}{20}$	$13 \times \frac{14}{20}$	$7 \times 7 \times \frac{13}{20}$	$18 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{15}{20}$	$7 \times 7 \times \frac{14}{20}$	102 and under 110
$\frac{10}{20}$	$13 \times \frac{15}{20}$	$7 \times 7 \times \frac{14}{20}$	$18 \times \frac{13}{20}$			$8 \times 8 \times \frac{13}{20}$	110 and under 118
$\frac{10}{20}$	$13 \times \frac{16}{20}$	$7 \times 7 \times \frac{15}{20}$	$18 \times \frac{14}{20}$			$8 \times 8 \times \frac{14}{20}$	118 and under 126
		$7 \times 7 \times \frac{16}{20}$	$18 \times \frac{15}{20}$			$8 \times 8 \times \frac{15}{20}$	126 and under 134

fitted, and one-fourth the breadth where three rows are fitted.
pillars with an addition of 6 feet for the weather deck clear of the deck erections, and 5 feet for an awning, shelter,

be taken as being 6 feet.

NUMBERS.* $\frac{S \times B \times H}{100}$	LENGTH AND FO					
	18 feet and under 20 feet.				20 feet and	
	TUBULAR.	DOUBLE CHANNELS AND FACE PLATES.		FOUR ANGLES.	TUBULAR.	DOUBLE CHAN FACE PL
	Outside diameter.	Channels.	Plates.		Outside diameter.	Channels.
	inches.	inches.	inches.	inches.	inches.	inches.
11 and under 13	$8 \times \frac{8}{20}$	$8 \times 4 \times 4 \times \frac{11}{20}$		$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{8}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$8 \times 4 \times 4 \times$
13 and under 16	$8\frac{1}{2} \times \frac{8}{20}$	$8 \times 4 \times 4 \times \frac{12}{20}$		$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$	$9 \times \frac{8}{20}$	$8 \times 4 \times 4 \times$
16 and under 19	$9 \times \frac{8}{20}$	$8 \times 4 \times 4 \times \frac{13}{20}$		$5 \times 5 \times \frac{8}{20}$	$9 \times \frac{9}{20}$	$8 \times 4 \times 4 \times$
19 and under 22	$9 \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{14}{20}$		$5 \times 5 \times \frac{9}{20}$	$10 \times \frac{8}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
22 and under 25	$10 \times \frac{8}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times \frac{8}{20}$	$5 \times 5 \times \frac{10}{20}$	$10 \times \frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
25 and under 29	$10 \times \frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{11}{20}$	$10 \times \frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
29 and under 33	$10 \times \frac{10}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{12}{20}$	$10 \times \frac{10}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
33 and under 37	$11 \times \frac{10}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	$11 \times \frac{10}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
37 and under 42	$12 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	$12 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
42 and under 47	$12 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	$12 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
47 and under 52	$13 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	$13 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
52 and under 58	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{14}{20}$	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
58 and under 64	$14 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$13 \times \frac{13}{20}$	$7 \times 7 \times \frac{12}{20}$	$14 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
64 and under 71	$15 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$13 \times \frac{14}{20}$	$7 \times 7 \times \frac{13}{20}$	$15 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
71 and under 78	$16 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{15}{20}$	$7 \times 7 \times \frac{14}{20}$	$16 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
78 and under 86	$17 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{16}{20}$	$7 \times 7 \times \frac{15}{20}$	$17 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
86 and under 94	$18 \times \frac{12}{20}$			$7 \times 7 \times \frac{16}{20}$	$18 \times \frac{12}{20}$	
94 and under 102	$18 \times \frac{13}{20}$			$7 \times 7 \times \frac{17}{20}$	$18 \times \frac{13}{20}$	
102 and under 110	$18 \times \frac{14}{20}$			$8 \times 8 \times \frac{16}{20}$	$18 \times \frac{14}{20}$	
110 and under 118	$18 \times \frac{15}{20}$			$8 \times 8 \times \frac{17}{20}$	$18 \times \frac{15}{20}$	
118 and under 126						
126 and under 134						

5. Pillars of other form will be admitted provided the same are of equivalent strength to those given in th

6. Where no seating is fitted, wide spaced hold pillars are to be stepped when practicable at an inte fitted on each side of the floors beneath the pillars.

7. For sizes of ordinary solid pillars *see* Table S 1A, and for ordinary hollow pillars *see* Table S 1B.

(For 24 feet and above, see continuation.)

RM OF PILLAR.							
under 22 feet.			22 feet and under 24 feet.				NUMBERS.* $\frac{S \times B \times H}{100}$
NNELS AND LATES.		FOUR ANGLES.	TUBULAR.	DOUBLE CHANNELS AND FACE PLATES.		FOUR ANGLES.	
	Plates.		Outside diameter.	Channels.	Plates.		
	inches.	inches.	inches.	inches.	inches.	inches.	
$\times\frac{12}{20}$		$4\frac{1}{2}\times4\frac{1}{2}\times\frac{9}{20}$	$9\times\frac{8}{20}$	$8\times4\times4\times\frac{13}{20}$		$5\times5\times\frac{9}{20}$	11 and under 13
$\times\frac{13}{20}$		$5\times5\times\frac{8}{20}$	$9\times\frac{9}{20}$	$8\times4\times4\times\frac{14}{20}$		$5\times5\times\frac{9}{20}$	13 and under 16
$\times\frac{14}{20}$		$5\times5\times\frac{9}{20}$	$10\times\frac{8}{20}$	$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{7}{20}$	$10\times\frac{8}{20}$	$5\times5\times\frac{10}{20}$	16 and under 19
$\times\frac{7}{20}$	$10\times\frac{8}{20}$	$5\times5\times\frac{10}{20}$	$10\times\frac{8}{20}$	$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{7}{20}$	$10\times\frac{8}{20}$	$5\times5\times\frac{10}{20}$	19 and under 22
$\times\frac{7}{20}$	$10\times\frac{10}{20}$	$5\times5\times\frac{11}{20}$	$10\times\frac{9}{20}$	$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{7}{20}$	$10\times\frac{10}{20}$	$5\times5\times\frac{11}{20}$	22 and under 25
$\times\frac{7}{20}$	$10\times\frac{10}{20}$	$5\times5\times\frac{11}{20}$	$10\times\frac{10}{20}$	$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{8}{20}$	$10\times\frac{10}{20}$	$5\times5\times\frac{12}{20}$	25 and under 29
$\times\frac{8}{20}$	$10\times\frac{10}{20}$	$5\times5\times\frac{12}{20}$	$11\times\frac{10}{20}$	$10\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{8}{20}$	$11\times\frac{10}{20}$	$6\times6\times\frac{10}{20}$	29 and under 33
$\times\frac{8}{20}$	$11\times\frac{10}{20}$	$6\times6\times\frac{10}{20}$	$12\times\frac{10}{20}$	$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{8}{20}$	$12\times\frac{10}{20}$	$6\times6\times\frac{11}{20}$	33 and under 37
$\times\frac{8}{20}$	$12\times\frac{10}{20}$	$6\times6\times\frac{11}{20}$	$12\times\frac{11}{20}$	$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$	$12\times\frac{10}{20}$	$6\times6\times\frac{12}{20}$	37 and under 42
$\times\frac{9}{20}$	$12\times\frac{10}{20}$	$6\times6\times\frac{12}{20}$	$13\times\frac{11}{20}$	$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$	$12\times\frac{12}{20}$	$6\times6\times\frac{13}{20}$	42 and under 47
$\times\frac{9}{20}$	$12\times\frac{12}{20}$	$6\times6\times\frac{13}{20}$	$13\times\frac{12}{20}$	$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$	$12\times\frac{12}{20}$	$6\times6\times\frac{14}{20}$	47 and under 52
$\times\frac{10}{20}$	$12\times\frac{12}{20}$	$6\times6\times\frac{14}{20}$	$14\times\frac{12}{20}$	$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$	$12\times\frac{13}{20}$	$6\times6\times\frac{15}{20}$	52 and under 58
$\times\frac{9}{20}$	$13\times\frac{13}{20}$	$7\times7\times\frac{12}{20}$	$15\times\frac{12}{20}$	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$	$13\times\frac{14}{20}$	$7\times7\times\frac{13}{20}$	58 and under 64
$\times\frac{9}{20}$	$13\times\frac{14}{20}$	$7\times7\times\frac{13}{20}$	$16\times\frac{12}{20}$	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$	$13\times\frac{15}{20}$	$7\times7\times\frac{14}{20}$	64 and under 71
$\times\frac{10}{20}$	$13\times\frac{15}{20}$	$7\times7\times\frac{14}{20}$	$17\times\frac{12}{20}$	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$	$13\times\frac{16}{20}$	$7\times7\times\frac{15}{20}$	71 and under 78
$\times\frac{10}{20}$	$13\times\frac{16}{20}$	$7\times7\times\frac{15}{20}$	$18\times\frac{12}{20}$			$7\times7\times\frac{16}{20}$	78 and under 86
		$7\times7\times\frac{16}{20}$	$18\times\frac{13}{20}$			$7\times7\times\frac{17}{20}$	86 and under 94
		$7\times7\times\frac{17}{20}$	$18\times\frac{14}{20}$			$8\times8\times\frac{16}{20}$	94 and under 102
		$8\times8\times\frac{16}{20}$	$18\times\frac{15}{20}$			$8\times8\times\frac{17}{20}$	102 and under 110
		$8\times8\times\frac{17}{20}$					110 and under 118
							118 and under 126
							126 and under 134

he Table.

ersection of floors and intercostals; but in cases wherein this cannot be done, intercostal brackets are to be

NUMBERS. * $\frac{S \times B \times H}{100}$	LENGTH AND F					
	24 feet and under 26 feet.				26 feet and	
	TUBULAR. ○	DOUBLE CHANNELS AMD FACE PLATES		FOUR ANGLES.	TUBULAR. ○	DOUBLE CHAN FACE PL
	Outside diameter.	Channels.	Plates.		Outside diameter.	Channels.
	inches.	inches.	inches	inches.	inches.	inches
11 and under 13	$9 \times \frac{9}{20}$	$8 \times 4 \times 4 \times \frac{14}{20}$		$5 \times 5 \times \frac{10}{20}$	$10 \times \frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
13 and under 16	$10 \times \frac{8}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times \frac{8}{20}$	$5 \times 5 \times \frac{10}{20}$	$10 \times \frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
16 and under 19	$10 \times \frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{11}{20}$	$10 \times \frac{10}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
19 and under 22	$10 \times \frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{11}{20}$	$10 \times \frac{10}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
22 and under 25	$10 \times \frac{10}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{12}{20}$	$11 \times \frac{9}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
25 and under 29	$10 \times \frac{10}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	$11 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
29 and under 33	$11 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	$12 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
33 and under 37	$12 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	$12 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
37 and under 42	$12 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	$12 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
42 and under 47	$13 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	$13 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
47 and under 52	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{14}{20}$	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
52 and under 58	$14 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{13}{20}$	$6 \times 6 \times \frac{15}{20}$	$14 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
58 and under 64	$15 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$13 \times \frac{14}{20}$	$7 \times 7 \times \frac{13}{20}$	$15 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
64 and under 71	$16 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{15}{20}$	$7 \times 7 \times \frac{14}{20}$	$16 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times$
71 and under 78	$17 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{16}{20}$	$7 \times 7 \times \frac{15}{20}$	$17 \times \frac{12}{20}$	
78 and under 86	$18 \times \frac{12}{20}$			$7 \times 7 \times \frac{16}{20}$	$18 \times \frac{12}{20}$	
86 and under 94	$18 \times \frac{13}{20}$			$7 \times 7 \times \frac{17}{20}$		
94 and under 102	$18 \times \frac{14}{20}$			$8 \times 8 \times \frac{16}{20}$		
102 and under 110						
110 and under 118						
118 and under 126						
126 and under 134						

8. For some methods of attaching the pillars at heads and heels, *see* sketches, page 162.

…ORM OF PILLAR.							
…nder 28 feet.			28 feet and under 30 feet.				NUMBERS.* $\frac{S \times B \times H}{100}$
…NELS AND …ATES.		FOUR ANGLES.	TUBULAR.	DOUBLE CHANNELS AND FACE PLATES.		FOUR ANGLES.	
…	Plates.		Outside diameter.	Channels.	Plates.		
	inches.	inches.	inches.	inches.	inches.	inches.	
…$\frac{7}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{11}{20}$	$10 \times \frac{10}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	11 and under 13
…$\frac{7}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{11}{20}$	$10 \times \frac{10}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	13 and under 16
…$\frac{8}{20}$	$10 \times \frac{10}{20}$	$5 \times 5 \times \frac{12}{20}$	$11 \times \frac{9}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	16 and under 19
…$\frac{8}{20}$	$11 \times \frac{10}{20}$	$6 \times 6 \times \frac{10}{20}$	$11 \times \frac{9}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	19 and under 22
…$\frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	$11 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	22 and under 25
…$\frac{8}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{11}{20}$	$11 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	25 and under 29
…$\frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	$12 \times \frac{10}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	29 and under 33
…$\frac{9}{20}$	$12 \times \frac{10}{20}$	$6 \times 6 \times \frac{12}{20}$	$12 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	33 and under 37
…$\frac{9}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{13}{20}$	$13 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{14}{20}$	37 and under 42
…$\frac{10}{20}$	$12 \times \frac{12}{20}$	$6 \times 6 \times \frac{14}{20}$	$13 \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times \frac{13}{20}$	$6 \times 6 \times \frac{15}{20}$	42 and under 47
…0	$12 \times \frac{13}{20}$	$6 \times 6 \times \frac{15}{20}$	$14 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$13 \times \frac{14}{20}$	$7 \times 7 \times \frac{13}{20}$	47 and under 52
…0	$12 \times \frac{15}{20}$	$6 \times 6 \times \frac{16}{20}$	$15 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{15}{20}$	$7 \times 7 \times \frac{14}{20}$	52 and under 58
…0	$13 \times \frac{15}{20}$	$7 \times 7 \times \frac{14}{20}$	$16 \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$13 \times \frac{16}{20}$	$7 \times 7 \times \frac{15}{20}$	58 and under 64
…0	$13 \times \frac{16}{20}$	$7 \times 7 \times \frac{15}{20}$	$17 \times \frac{12}{20}$			$7 \times 7 \times \frac{16}{20}$	64 and under 71
		$7 \times 7 \times \frac{16}{20}$	$18 \times \frac{12}{20}$			$8 \times 8 \times \frac{15}{20}$	71 and under 78
							78 and under 86
							86 and under 94
							94 and under 102
							102 and under 110
							110 and under 118
							118 and under 126
							126 and under 134

TABLE OF SCANTLINGS OF GIRDERS

NUMBER. $\frac{* S^2 \times B \times H}{100}$	Thickness of Intercostal Plate and Angle.	5 inches.	6 inches.	7 inches.		8 inches.	
		Double Channels.	Double Channels.	Double Channels.	Rider Plate.	Double Channels.	
		inches.	inches.	inches.	inches.	inches.	i
150 and under 180	$\frac{7}{20}$	$5 \times 3 \times 3 \times \frac{8}{20}$					
180 and under 210	$\frac{7}{20}$	$6 \times 3 \times 3 \times \frac{8}{20}$	$5 \times 3 \times 3 \times \frac{8}{20}$				
210 and under 250	$\frac{7}{20}$	$7 \times 3 \times 3 \times \frac{8}{20}$	$6 \times 3 \times 3 \times \frac{8}{20}$	$5 \times 3 \times 3 \times \frac{8}{20}$			
250 and under 290	$\frac{8}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$7 \times 3 \times 3 \times \frac{8}{20}$	$6 \times 3 \times 3 \times \frac{8}{20}$		$5 \times 3 \times 3 \times \frac{8}{20}$	
290 and under 330	$\frac{8}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$7 \times 3 \times 3 \times \frac{8}{20}$		$6 \times 3 \times 3 \times \frac{8}{20}$	
330 and under 380	$\frac{8}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$		$7 \times 3 \times 3 \times \frac{8}{20}$	
380 and under 430	$\frac{8}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$		$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	
430 and under 480	$\frac{9}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$		$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	
480 and under 540	$\frac{9}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$		$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	
540 and under 600	$\frac{9}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$		$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	
600 and under 670	$\frac{9}{20}$		$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$		$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	
670 and under 740	$\frac{9}{20}$		$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$		$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	
740 and under 820	$\frac{10}{20}$			$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$		$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	
820 and under 900	$\frac{10}{20}$			$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$		$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	
900 and under 990	$\frac{10}{20}$			$12 \times 4 \times 4 \times \frac{15}{20}$		$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$	
990 and under 1090	$\frac{10}{20}$			$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$	$8 \times \frac{14}{20}$	$12 \times 4 \times 4 \times \frac{15}{20}$	
1090 and under 1200	$\frac{10}{20}$					$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$	8
1200 and under 1320	$\frac{10}{20}$					$12 \times 4 \times 4 \times \frac{14}{20}$	9
1320 and under 1450	$\frac{10}{20}$					$12 \times 4 \times 4 \times \frac{15}{20}$	9
1450 and under 1590	$\frac{11}{20}$						
1590 and under 1740	$\frac{11}{20}$						
1740 and under 1900	$\frac{11}{20}$						
1900 and under 2070	$\frac{11}{20}$						

1.* S is the fore and aft spacing of the pillars in feet from centre to centre.

B is one-third the breadth of vessel in feet at the deck when two rows of pillars are fitted, and one-fourth the breadtl when three rows are fitted.

H is the height of the 'tween decks next above the girder, measured in feet from top of beam to top of beam, where th pillars in the 'tween decks are spaced the same as those below. In the case of decks fitted exclusively for the accommodatio of passengers, and for a weather deck clear of the deck erections, H is to be taken as 6 feet. For girders under an awning shelter, poop, bridge or forecastle deck, H is to be taken as 5 feet.

Where the pillars above a deck are not placed over those below, H is to be the sum of the heights of the severa 'tween decks in feet above the girder, with the addition of 6 feet for the weather deck clear of the deck erections, or of 5 fee for an awning, shelter, poop, bridge or forecastle deck.

2. For methods of obtaining the numbers regulating the scantlings for girders, *see* sketches on pages 166, 167, and 168.

3. The girders are to consist of double channels, intercostal plate and rider plate, of the scantlings given in the Tabl

DEPTH OF BEAMS.							
9 inches.		10 inches.		11 inches.		12 inches.	
SIZE OF GIRDERS.							
Double Channels.	Rider Plate.	Double Channels.	Rider Plate.	Double Channels.	Rider Plate.	Double Channels.	Rider Plate.
inches.	inches.	inches.	inches.	inches.	inches.	inches	inches.
$5\times3\times3\times\frac{8}{20}$							
$6\times3\times3\times\frac{8}{20}$		$5\times3\times3\times\frac{8}{20}$					
$7\times3\times3\times\frac{8}{20}$		$6\times3\times3\times\frac{8}{20}$		$5\times3\times3\times\frac{8}{20}$			
$7\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$		$7\times3\times3\times\frac{8}{20}$		$6\times3\times3\times\frac{8}{20}$		$5\times3\times3\times\frac{8}{20}$	
$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$		$7\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$		$7\times3\times3\times\frac{8}{20}$		$6\times3\times3\times\frac{8}{20}$	
$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$		$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$		$7\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$		$7\times3\times3\times\frac{8}{20}$	
$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$		$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$		$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$		$7\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$	
$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$		$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$		$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{9}{20}$	
$10\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$		$8\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$	
$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$10\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{10}{20}$	
$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$10\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$9\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$	
$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$		$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$10\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$	
$12\times4\times4\times\frac{15}{20}$		$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$		$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$		$11\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$	
$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$	$8\times\frac{14}{20}$	$12\times4\times4\times\frac{15}{20}$		$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$		$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{12}{20}$	
$12\times4\times4\times\frac{14}{20}$	$9\times\frac{14}{20}$	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$	$8\times\frac{14}{20}$	$12\times4\times4\times\frac{15}{20}$		$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$	
$12\times4\times4\times\frac{15}{20}$	$9\times\frac{15}{20}$	$12\times4\times4\times\frac{14}{20}$	$9\times\frac{14}{20}$	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$	$8\times\frac{14}{20}$	$12\times4\times4\times\frac{15}{20}$	
		$12\times4\times4\times\frac{15}{20}$	$9\times\frac{15}{20}$	$12\times4\times4\times\frac{14}{20}$	$9\times\frac{14}{20}$	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\frac{14}{20}$	$8\times\frac{14}{20}$
				$12\times4\times4\times\frac{15}{20}$	$10\times\frac{15}{20}$	$12\times4\times4\times\frac{15}{20}$	$9\times\frac{15}{20}$
						$12\times4\times4\times\frac{15}{20}$	$11\times\frac{15}{20}$

4. The intercostal plates and channels are to be fitted in long lengths and efficiently strapped or lapped at the butts to the Surveyor's satisfaction.

5. The channels are to be attached by two rivets to the lower flanges of the beams, or, in the case of angle or bulb angle beams to short angle lugs fitted to the beams, and are to be efficiently bracketed to the bulkheads with plates three times the depth of the channels forming girders, measured from the upper edges of the channels and of the same thickness as the channels. The angle attaching the intercostal plate to the deck plating is to be of the same thickness as the plate, this angle is to be 3 ins. × 3 ins. where the rivets in the intercostal plate are required to be $\frac{3}{4}$ ins. in diameter, and $3\frac{1}{2}$ ins. × $3\frac{1}{2}$ ins. where they are $\frac{7}{8}$ ins. in diameter. The channels are to be zigzag riveted and the rivets spaced not more than 7 diameters apart, and those in the flanges of the intercostal angle not more than 5 diameters apart, centre to centre.

6. Girders of other form will be admitted provided the same are of equivalent strength to those given in the Table.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.—*27th April, 1905.*

STEEL VESSELS.

Table of Minimum Dimensions of KEELS, STEMS,

NUMBERS. For Keel, Stem, Sternpost, and Plating. *(See Section 2.)*	Bar Keels for All Grades.	Stem of Sailing Vessels, and Steamers, and Sternpost of Sailing Vessels and Paddle Steamers.	Stern frames of Screw Steamers.	THICKNESS OF					
				Flat Plate Keels for all grades, breadth, and thickness.		Garboard Strakes, breadth and thickness.			
						100A		90A	
				Three-fifths length amidships.	Ends.	Half length amidships	Ends.	Half length amidships.	Ends.
	inches.	inches.	inches.	inches.		inches.		inches.	
2600 and under 3300	$6 \times 1\frac{1}{8}$	$5\frac{1}{2} \times 1\frac{1}{8}$	$5\frac{1}{4} \times 2\frac{1}{4}$	30×8	6	30×6	6	30×6	6
3300 and under 4200	$6\frac{1}{2} \times 1\frac{1}{8}$	$5\frac{3}{4} \times 1\frac{1}{8}$	$5\frac{3}{4} \times 2\frac{1}{2}$	30×8	6	30×7	7	30×6	6
4200 and under 5100	$6\frac{3}{4} \times 1\frac{1}{4}$	$6 \times 1\frac{1}{4}$	$6 \times 2\frac{1}{2}$	30×9	7	30×7	7	30×6	6
5100 and under 6000	$7 \times 1\frac{3}{8}$	$6 \times 1\frac{3}{8}$	6×3	31×9	8	31×8	8	31×7	7
6000 and under 6900	$7 \times 1\frac{1}{2}$	$6\frac{1}{4} \times 1\frac{1}{2}$	$6\frac{1}{4} \times 3$	31×10	8	31×8	8	31×7	7
6900 and under 7700	$7 \times 1\frac{5}{8}$	$6\frac{1}{4} \times 1\frac{5}{8}$	$6\frac{1}{2} \times 3\frac{1}{4}$	31×11	8	31×9	8	31×8	8
7700 and under 8500	$7 \times 1\frac{3}{4}$	$6\frac{1}{2} \times 1\frac{3}{4}$	$6\frac{1}{2} \times 3\frac{1}{2}$	31×12	9	31×9	8	31×8	8
8500 and under 9300	$7\frac{1}{4} \times 1\frac{7}{8}$	$6\frac{1}{2} \times 1\frac{7}{8}$	$6\frac{1}{2} \times 3\frac{3}{4}$	32×12	9	32×9	8	32×8	8
9300 and under 10100	$7\frac{1}{2} \times 1\frac{7}{8}$	$6\frac{3}{4} \times 1\frac{7}{8}$	$6\frac{3}{4} \times 4$	32×12	9	32×9	8	32×8	8
10100 and under 10900	$7\frac{1}{2} \times 2$	$6\frac{3}{4} \times 2$	$6\frac{3}{4} \times 4\frac{1}{4}$	32×12	9	32×9	8	32×8	8
10900 and under 11600	$7\frac{1}{2} \times 2\frac{1}{8}$	$7 \times 2\frac{1}{8}$	$7 \times 4\frac{1}{4}$	33×12	9	33×9	8	33×8	8
11600 and under 12400	$7\frac{1}{2} \times 2\frac{1}{4}$	$7 \times 2\frac{1}{4}$	$7 \times 4\frac{1}{2}$	33×12	9	33×10	9	33×9	8
12400 and under 13100	$8 \times 2\frac{1}{4}$	$7 \times 2\frac{1}{4}$	$7 \times 4\frac{3}{4}$	33×13	10	33×10	9	33×9	8
13100 and under 13900	$8 \times 2\frac{1}{4}$	$7 \times 2\frac{1}{4}$	$7\frac{1}{4} \times 4\frac{3}{4}$	34×13	10	34×10	9	34×9	8
13900 and under 14700	$8 \times 2\frac{3}{8}$	$7\frac{1}{4} \times 2\frac{3}{8}$	$7\frac{1}{2} \times 4\frac{3}{4}$	34×14	11	34×11	10	34×10	9
14700 and under 15600	$8 \times 2\frac{3}{8}$	$7\frac{1}{2} \times 2\frac{3}{8}$	$8 \times 4\frac{3}{4}$	35×14	11	35×11	10	35×10	9
15600 and under 16600	$8\frac{1}{2} \times 2\frac{3}{8}$	$8 \times 2\frac{3}{8}$	8×5	36×14	11	36×11	10	36×10	9
16600 and under 17600	$9 \times 2\frac{3}{8}$	$8\frac{1}{2} \times 2\frac{3}{8}$	$8\frac{1}{2} \times 5$	36×14	11	36×11	10	36×10	9
17600 and under 18700	$9 \times 2\frac{1}{2}$	$8\frac{1}{2} \times 2\frac{1}{2}$	$8\frac{1}{2} \times 5$	36×16	12	36×12	11	36×11	10

TABLE S 2.

(For Nos. 18700 to 70000 see continuation.)

OUTSIDE PLATING IN $\frac{1}{20}$THS. OF AN INCH.

From Garboard to the lower edge of Sheerstrake.*				Sheerstrakes for all grades, breadth, and thickness.		From main to upper Sheerstrake in Spar-decked vessels.		Spar deck Sheerstrake, breadth and thickness.	
100A		90A							
Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.
				inches.				inches.	
5 & 6	5	5	5	30 × 6	5	...	...	...	...
6	5	5 & 6	5	30 × 7	6	...	...	...	...
6 (a)	5	5 & 6 (a)	5	31 × 7	6	...	...	...	...
6 & 7	5 & 6	6	5	31 × 8	7	...	...	...	...
6 & 7 (a)	5 & 6	6 (a)	5	32 × 8	7	...	...	...	...
7	6	6 & 7	5 & 6	32 × 9	8	...	...	...	...
7 (a)	6	6 & 7 (a)	5 & 6	33 × 9	8	...	...	...	...
7 & 8	6 & 7	7	6	33 × 10	8	...	...	...	...
7 & 8 (b)	6 & 7	7 (b)	6	34 × 10	8	...	...	...	...
8	7	7 & 8	6 & 7	34 × 10	8	...	...	...	...
8 (b)	7	7 & 8 (b)	6 & 7	35 × 10	8	...	...	...	...
8 & 9	7 & 8	8	7	35 × 10	8	...	...	...	...
8 & 9 (b)	7 & 8	8 (b)	7	36 × 10	8	...	...	...	...
9	8	8 & 9	7 & 8	36 × 11	9	7	6	36 × 9	8
9 (b)	8	8 & 9 (b)	7 & 8	38 × 11	9	7	6	38 × 9	8
9 & 10	8	9	8	38 × 11	9	7	6	38 × 9	8
9 & 10 (b)	8	9 (b)	8	40 × 12	9	8	7	40 × 10	8
10	8	9 & 10	8	40 × 12	9	8	7	40 × 10	8
10 (b)	8	9 & 10 (b)	8	42 × 13	10	8	7	40 × 11	9

For foot notes—*see continuation.*

STEEL VESSELS.

Table of Minimum Dimensions of KEELS, S

NUMBERS. For Keel, Stem, Sternpost, and Plating. (*See Section 2.*)	Bar Keels for All Grades.	Stem of Sailing Vessels, and Steamers, and Sternpost of Sailing Vessels and Paddle Steamers.	Stern frames of Screw Steamers.	THICKNESS OF — Flat Plate Keels for all grades, breadth, and thickness.† Three-fifths length amidships.	Flat Plate Keels — Ends.	Garboard Strakes, breadth and thickness. 100A Half length amidships.	100A Ends.	90A Half length amidships.	90A Ends.
	inches.	inches.	inches.	inches.		inches.			
18700 and under 19900	$9\frac{1}{2}\times2\frac{1}{2}$	$9\times2\frac{1}{2}$	9×5	36×16	12	36×12	11	...	...
19900 and under 21300	$9\frac{1}{2}\times2\frac{1}{2}$	$9\times2\frac{1}{2}$	$9\times5\frac{1}{2}$	36×16	12	36×12	11	...	...
21300 and under 22900	$10\times2\frac{1}{2}$	$10\times2\frac{1}{2}$	$10\times5\frac{1}{2}$	36×16	12	36×12	11	...	...
22900 and under 24600	$10\times2\frac{5}{8}$	$10\times2\frac{5}{8}$	10×6	36×16	12	36×12	11	...	...
24600 and under 26500	$10\times2\frac{3}{4}$	$10\times2\frac{3}{4}$	10×6	36×16	12	36×12	11	...	...
26500 and under 28700	$10\frac{1}{2}\times2\frac{3}{4}$	$10\frac{1}{2}\times2\frac{3}{4}$	11×6	36×16	12	36×12	11	...	...
28700 and under 31200	$11\times2\frac{3}{4}$	$11\times2\frac{3}{4}$	$11\times6\frac{1}{2}$	36×17	13	36×13	12	...	...
31200 and under 33900	$11\times2\frac{7}{8}$	$11\times2\frac{7}{8}$	$11\times6\frac{3}{4}$	36×17	13	36×13	12	...	...
33900 and under 36800	11×3	11×3	11×7	36×18	14	36×14	13	...	...
36800 and under 40000	$11\times3\frac{1}{8}$	$11\times3\frac{1}{8}$	$11\times7\frac{1}{2}$	36×18	14	36×14	13	...	...
40000 and under 43400	$11\frac{1}{2}\times3\frac{1}{8}$	$11\frac{1}{2}\times3\frac{1}{8}$	$11\frac{1}{2}\times7\frac{1}{2}$	36×18	14	36×14	13	...	...
43400 and under 47100	$12\times3\frac{1}{8}$	$12\times3\frac{1}{8}$	$12\times7\frac{3}{4}$	36×18	14	36×14	13	...	...
47100 and under 51000	$12\times3\frac{1}{4}$	$12\times3\frac{1}{4}$	$12\frac{1}{2}\times7\frac{3}{4}$	36×20	15	36×15	14	...	...
51000 and under 55200	$12\times3\frac{3}{8}$	$12\times3\frac{3}{8}$	13×8	36×20	15	36×15	14	...	...
55200 and under 59700	$12\times3\frac{1}{2}$	$12\times3\frac{1}{2}$	$13\times8\frac{1}{2}$	36×20	15	36×15	14	...	...
59700 and under 64600	$12\times3\frac{5}{8}$	$12\times3\frac{5}{8}$	13×9	36×20	15	36×15	14	...	...
64600 and under 70000	$12\times3\frac{3}{4}$	$12\times3\frac{3}{4}$	$13\times9\frac{1}{2}$	36×21	16	36×16	15	...	...

MEM.—The Scantlings given in the above Table are intended for Vessels the length of which does not exceed *eleven times* their depth *from top of keel*, see Section 1. For Vessels which exceed this proportion, *see Section* 46 *and Table S* 6. For proportions of breadth to length, *see Table S* 5.

* In the columns for plating, where two thicknesses are given they are to be worked in alternate strakes, and the larger thickness is to apply to the outer strakes, and the smaller one to the inner strakes: and the size of the rivets and double riveting to be regulated by the thickness of the thicker plating.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.—*27th April, 1905.*

OUTSIDE PLATING IN $\frac{1}{20}$THS. OF AN INCH

From Garboard to the lower edge of Sheerstrake.*				Sheerstrakes for all grades, breadth, and thickness.		From main to upper Sheerstrake in Spar-decked vessels.		Spar deck Sheerstrake, breadth and thickness.	
100A		90A							
Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.	Half length amidships.	Ends.
10 & 11	8 & 9	...	...	inches. 42 × 13	10	8	7	inches. 40 × 11	9
10 & 11 (*b*)	8 & 9	...	...	42 × 13	10	8	7	40 × 11	9
11	9	...	...	42 × 13	10	8	7	40 × 11	9
11 (*b*)	9	...	...	42 × 13	10	8	7	40 × 11	9
11 & 12	9	...	...	42 × 13	10	8	7	40 × 11	9
11 & 12 (*c*)	9	...	...	44 × 13	10	8	7	40 × 11	9
12	9	...	...	44 × 13	10	9	8	40 × 11	9
12 (*c*)	9	...	...	44 × 13	10	9	8	40 × 11	9
12 & 13	9 & 10	...	...	44 × 14	11	9	8	40 × 12	9
12 & 13 (*c*)	9 & 10	...	...	44 × 14	11	9	8	40 × 12	9
13	10	...	...	44 × 14	11	9	8	40 × 12	9
13 (*c*)	10	...	...	46 × 15	12	9	8	40 × 13	10
13 & 14	10 & 11	...	...	46 × 15	12	9	8	40 × 13	10
13 & 14 (*c*)	10 & 11	...	...	46 × 16	13	9	8	40 × 14	11
14	11	...	...	46 × 16	13	9	8	40 × 14	11
14 (*c*)	11	...	...	46 × 16	13	9	8	40 × 14	11
14 & 15	11 & 12	...	...	46 × 16	13	9	8	40 × 14	11

(*a*). One strake at Bilge increased $\frac{1}{20}$ of an inch in thickness all fore and aft.
(*b*). Two strakes " " $\frac{1}{20}$ " " " " "
(*c*). Three " " $\frac{1}{20}$ " " " " "

† Where the number is 26,000 and above, the flat plate keel to be doubled for one-half the vessel's length amidships (*see Sections* 5 *and* 9).

For side plating of awning decks, part awning decks, poops, bridges and forecastles, *see* Table S 2 A.

STEEL VESSELS.

SCANTLINGS* FOR ONE HALF VESSEL'S LENGTH AMIDSHIPS OF A
ONE FIFTH LENGTH OF VESSEL INCLUDING THE ADDITION

Proportions of Rule Length to Rule Depth.	ITEMS.	10000 and under 12500	12500 and under 15500	15500 and under 18500	18500 and under 21500	21500 and under 24500
		inches.	inches.	inches.	inches.	inches.
Under 11	Sheerstrake	$36 \times \frac{8}{20}$	$36 \times \frac{8}{20}$	$36 \times \frac{9}{20}$	$38 \times \frac{9}{20}$	$38 \times \frac{10}{20}$
	Side Plating	$\frac{7}{20}$	$\frac{8}{20}$	$\frac{8}{20}$	$\frac{8}{20}$	$\frac{9}{20}$
	Stringer	$36 \times \frac{7}{20}$	$36 \times \frac{7}{20}$	$38 \times \frac{7}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$
	Iron or Steel deck ..	—	—	—	—	$\frac{5}{16}$ or $\frac{6}{20}$
11 and under 12	Sheerstrake	$36 \times \frac{8}{20}$	$36 \times \frac{9}{20}$	$36 \times \frac{9}{20}$	$38 \times \frac{10}{20}$	$38 \times \frac{11}{20}$
	Side Plating	$\frac{8}{20}$	$\frac{8}{20}$	$\frac{9}{20}$	$\frac{9}{20}$	$\frac{9}{20}$
	Stringer	$36 \times \frac{7}{20}$	$38 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$
	Iron or Steel deck ..	—	—	—	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$
12 and under 13	Sheerstrake	$36 \times \frac{9}{20}$	$36 \times \frac{9}{20}$	$36 \times \frac{10}{20}$	$38 \times \frac{10}{20}$	$38 \times \frac{11}{20}$
	Side Plating	$\frac{8}{20}$	$\frac{9}{20}$	$\frac{9}{20}$	$\frac{10}{20}$	$\frac{10}{20}$
	Stringer	$36 \times \frac{7}{20}$	$38 \times \frac{8}{20}$	$38 \times \frac{9}{20}$	$38 \times \frac{9}{20}$	$40 \times \frac{9}{20}$
	Iron or Steel deck ..	—	—	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$
13 and under 14	Sheerstrake	$36 \times \frac{9}{20}$	$38 \times \frac{10}{20}$	$38 \times \frac{10}{20}$	$38 \times \frac{11}{20}$	$40 \times \frac{12}{20}$
	Side Plating	$\frac{8}{20}$	$\frac{9}{20}$	$\frac{10}{20}$	$\frac{10}{20}$	$\frac{10}{20}$
	Stringer	$36 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$38 \times \frac{9}{20}$	$38 \times \frac{9}{20}$	$40 \times \frac{9}{20}$
	Iron or Steel deck ..	—	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{6}{16}$ or $\frac{7}{20}$
14 and under 15	Sheerstrake	$36 \times \frac{10}{20}$	$38 \times \frac{10}{20}$	$38 \times \frac{11}{20}$	$38 \times \frac{12}{20}$	$40 \times \frac{12}{20}$
	Side Plating	$\frac{8}{20}$	$\frac{9}{20}$	$\frac{10}{20}$	$\frac{11}{20}$	$\frac{11}{20}$
	Stringer	$36 \times \frac{8}{20}$	$38 \times \frac{9}{20}$	$38 \times \frac{9}{20}$	$40 \times \frac{9}{20}$	$40 \times \frac{10}{20}$
	Iron or Steel deck ..	—	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{6}{16}$ or $\frac{7}{20}$
15 and under 16	Sheerstrake	$36 \times \frac{10}{20}$	$38 \times \frac{11}{20}$	$38 \times \frac{12}{20}$	$40 \times \frac{12}{20}$	$40 \times \frac{13}{20}$
	Side Plating	$\frac{9}{20}$	$\frac{10}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$\frac{12}{20}$
	Stringer	$36 \times \frac{9}{20}$	$38 \times \frac{9}{20}$	$38 \times \frac{9}{20}$	$40 \times \frac{10}{20}$	$40 \times \frac{10}{20}$
	Iron or Steel deck ..	—	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{5}{16}$ or $\frac{6}{20}$	$\frac{6}{16}$ or $\frac{7}{20}$

* Where it is intended to fit erections on a spar, awning or shelter decked vessel, the scantlings of the variou
structure intended for passenger accommodation is to be built upon another superstructure, the deck beams above s
** Where the rule length of the vessel exceeds eleven times the rule depth, and the bridge does not extend over
from within the ends of the bridge to a quarter the vessel's length from each end. All vessels having a length of thi

SCANTLINGS OF POOPS AND FORECASTLES, ALSO OF BRID
NOT INCLUDING THE ADDITIONS FOR

		Under 10000	10000 and under 12500	12500 and under 15500	15500 and under 18500	18500 and under 21500
		inches.	inches.	inches.	inches.	inches.
Side Plating	Bridges	$\frac{5}{20}$	$\frac{5}{20}$	$\frac{6}{20}$	$\frac{6}{20}$	$\frac{7}{20}$
	Forecastles, and Forward end of Awning decks	$\frac{5}{20}$	$\frac{5}{20}$	$\frac{6}{20}$	$\frac{6}{20}$	$\frac{7}{20}$
	Poops, and After end of Awning decks	$\frac{5}{20}$	$\frac{5}{20}$	$\frac{6}{20}$	$\frac{6}{20}$	$\frac{6}{20}$
Deck Stringer	Bridges	$\frac{5}{20}$	$36 \times \frac{5}{20}$	$36 \times \frac{6}{20}$	$38 \times \frac{7}{20}$	$40 \times \frac{7}{20}$
	Poops and Forecastles and Ends of Awning decks	$\frac{5}{20}$	$20 \times \frac{5}{20}$	$22 \times \frac{6}{20}$	$24 \times \frac{6}{20}$	$26 \times \frac{7}{20}$
Breadth of Tie Plates		7	8	9	10	11

TABLE S 2 A.

WNING DECKS, PART AWNING DECKS, AND BRIDGES** EXCEEDING
S FOR PROPORTIONS REQUIRED TO TOPSIDES BY TABLE S 6.

PLATING NUMBER.

24500 and under 27500	27500 and under 31000	31000 and under 35000	35000 and under 39000	39000 and under 43000	43000 and under 47500	47500 and under 52000	52000 and under 57000
inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
$40 \times \frac{10}{20}$ $\frac{9}{20}$ $40 \times \frac{8}{20}$ $\frac{5}{16}$ or $\frac{6}{20}$	$40 \times \frac{10}{20}$ $\frac{9}{20}$ $40 \times \frac{9}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{11}{20}$ $\frac{10}{20}$ $40 \times \frac{9}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{11}{20}$ $\frac{10}{20}$ $42 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{12}{20}$ $\frac{11}{20}$ $42 \times \frac{10}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{13}{20}$ $\frac{11}{20}$ $42 \times \frac{10}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{13}{20}$ $\frac{12}{20}$ $42 \times \frac{10}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{14}{20}$ $\frac{12}{20}$ $44 \times \frac{10}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$
$40 \times \frac{11}{20}$ $\frac{10}{20}$ $40 \times \frac{8}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{11}{20}$ $\frac{10}{20}$ $40 \times \frac{9}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{12}{20}$ $\frac{11}{20}$ $40 \times \frac{9}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{12}{20}$ $\frac{11}{20}$ $42 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{13}{20}$ $\frac{12}{20}$ $42 \times \frac{10}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{14}{20}$ $\frac{12}{20}$ $42 \times \frac{10}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{14}{20}$ $\frac{12}{20}$ $42 \times \frac{11}{20}$ $\frac{7}{16} \times \frac{8}{20}$	$42 \times \frac{15}{20}$ $\frac{13}{20}$ $44 \times \frac{11}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$
$40 \times \frac{12}{20}$ $\frac{10}{20}$ $40 \times \frac{9}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{12}{20}$ $\frac{11}{20}$ $40 \times \frac{9}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{12}{20}$ $\frac{11}{20}$ $40 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{13}{20}$ $\frac{12}{20}$ $42 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{14}{20}$ $\frac{12}{20}$ $42 \times \frac{11}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{14}{20}$ $\frac{13}{20}$ $42 \times \frac{11}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{15}{20}$ $\frac{13}{20}$ $42 \times \frac{11}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{16}{20}$ $\frac{13}{20}$ $44 \times \frac{12}{20}$ $\frac{8}{16}$ or $\frac{9}{20}$
$40 \times \frac{12}{20}$ $\frac{11}{20}$ $40 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{12}{20}$ $\frac{12}{20}$ $42 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{13}{20}$ $\frac{12}{20}$ $42 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$42 \times \frac{14}{20}$ $\frac{13}{20}$ $42 \times \frac{10}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{15}{20}$ $\frac{13}{20}$ $42 \times \frac{11}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{15}{20}$ $\frac{14}{20}$ $44 \times \frac{11}{20}$ $\frac{8}{16}$ or $\frac{9}{20}$	$44 \times \frac{16}{20}$ $\frac{14}{20}$ $44 \times \frac{12}{20}$ $\frac{8}{16}$ or $\frac{9}{20}$	
$40 \times \frac{13}{20}$ $\frac{12}{20}$ $40 \times \frac{10}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$40 \times \frac{14}{20}$ $\frac{12}{20}$ $42 \times \frac{11}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$42 \times \frac{14}{20}$ $\frac{13}{20}$ $42 \times \frac{11}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$42 \times \frac{15}{20}$ $\frac{14}{20}$ $42 \times \frac{11}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$	$42 \times \frac{16}{20}$ $\frac{14}{20}$ $42 \times \frac{12}{20}$ $\frac{7}{16}$ or $\frac{8}{20}$			
$40 \times \frac{14}{20}$ $\frac{13}{20}$ $42 \times \frac{11}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$	$42 \times \frac{15}{20}$ $\frac{14}{20}$ $42 \times \frac{11}{20}$ $\frac{6}{16}$ or $\frac{7}{20}$						

parts of the erections are to be as required for a "three deck" vessel of the same dimensions; and where a super-
ch accommodation are to be plated over in way of the same.
he midship half length of the vessel, the additions for proportions required to the topsides by Table S 6 are to be fitted
een depths and above to the upper deck are to have a bridge extending over the midship half length of the vessel.

GES NOT EXCEEDING ONE FIFTH THE LENGTH OF VESSEL,
PROPORTIONS REQUIRED BY TABLE S 6.

PLATING NUMBER.

21500 and under 24500	24500 and under 27500	27500 and under 31000	31000 and under 35000	35000 and under 39000	39000 and under 43000	43000 and under 47500	47500 and under 52000	52000 and under 57000
inches. $\frac{7}{20}$ $\frac{7}{20}$ $\frac{7}{20}$	inches. $\frac{7}{20}$ $\frac{7}{20}$ $\frac{7}{20}$	inches. $\frac{8}{20}$ $\frac{8}{20}$ $\frac{7}{20}$	inches. $\frac{8}{20}$ $\frac{8}{20}$ $\frac{7}{20}$	inches. $\frac{8}{20}$ $\frac{8}{20}$ $\frac{8}{20}$	inches. $\frac{9}{20}$ $\frac{8}{20}$ $\frac{8}{20}$	inches. $\frac{9}{20}$ $\frac{9}{20}$ $\frac{8}{20}$	inches. $\frac{9}{20}$ $\frac{9}{20}$ $\frac{9}{20}$	inches. $\frac{9}{20}$ $\frac{9}{20}$ $\frac{9}{20}$
$42 \times \frac{7}{20}$ $28 \times \frac{7}{20}$	$44 \times \frac{7}{20}$ $30 \times \frac{7}{20}$	$46 \times \frac{8}{20}$ $32 \times \frac{7}{20}$	$48 \times \frac{8}{20}$ $34 \times \frac{8}{20}$	$50 \times \frac{8}{20}$ $36 \times \frac{8}{20}$	$52 \times \frac{9}{20}$ $38 \times \frac{8}{20}$	$54 \times \frac{9}{20}$ $40 \times \frac{8}{20}$	$57 \times \frac{9}{20}$ $42 \times \frac{8}{20}$	$60 \times \frac{9}{20}$ $44 \times \frac{8}{20}$
12	13	14	15	16	18	20	22	24

STEEL VESSELS.

Table of Minimum Dimensions of KEELSONS, KEELSON AND STRINGER

NUMBERS. To regulate keelsons, stringers, decks, rudders, and ceiling. (*See Section* 2.)	Size of middle-line keelsons standing upon floors, and thickness of rider plate to keelson.		Thickness of intercostal keelson plates.	Dimensions of angle bars for keelsons, and stringers in hold, for all grades.	Dimensions of angle bar on the middle, lower or hold, and orlop beam stringer plates, on upper deck stringer plates in spar-decked, and awning-decked vessels.	Dimensions of angle bars on upper deck stringer plates.
	Half length amidships.	Thickness at ends.				
	inches.	inches.	inches.	inches.	inches.	inches.
Under 2800	$7\frac{1}{2} \times \frac{6}{20}$	$\frac{5}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 2\frac{1}{2} \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
2800 and under 4100	$8\frac{1}{2} \times \frac{7}{20}$	$\frac{6}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
4100 and under 5400	$9 \times \frac{8}{20}$	$\frac{7}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
5400 and under 6700	$10 \times \frac{8}{20}$	$\frac{7}{20}$	$\frac{5}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$
6700 and under 7900	$11 \times \frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$
7900 and under 9100	$12 \times \frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{6}{20}$	$3 \times 3 \times \frac{7}{20}$
9100 and under 10300	$12 \times \frac{9}{20}$	$\frac{7}{20}$	$\frac{6}{20}$	$4 \times 3 \times \frac{6}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{6}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
10300 and under 11400	$12 \times \frac{10}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
11400 and under 12600	$13 \times \frac{10}{20}$	$\frac{8}{20}$	$\frac{7}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$4 \times 4 \times \frac{7}{20}$
12600 and under 13800	$14 \times \frac{11}{20}$	$\frac{9}{20}$	$\frac{7}{20}$	$5 \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$4 \times 4 \times \frac{8}{20}$
13800 and under 15100	$15 \times \frac{11}{20}$	$\frac{9}{20}$	$\frac{7}{20}$	$5 \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$4 \times 4 \times \frac{8}{20}$
15100 and under 16500	$16 \times \frac{12}{20}$	$\frac{10}{20}$	$\frac{8}{20}$	$5 \times 3\frac{1}{2} \times \frac{9}{20}$	$4 \times 4 \times \frac{8}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
16500 and under 18000	$17 \times \frac{12}{20}$	$\frac{10}{20}$	$\frac{8}{20}$	$5 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
18000 and under 19700	$18 \times \frac{13}{20}$	$\frac{11}{20}$	$\frac{8}{20}$	$5\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
19700 and under 21700	$19 \times \frac{13}{20}$	$\frac{11}{20}$	$\frac{8}{20}$	$5\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$
21700 and under 24100	$20 \times \frac{13}{20}$	$\frac{11}{20}$	$\frac{9}{20}$	$6 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$
24100 and under 27000	$20 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$
27000 and under 30400	$22 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$
30400 and under 34300	$23 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{20}$
34300 and under 38800	$25 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{20}$
38800 and under 43900	$27 \times \frac{14}{20}$	$\frac{12}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
43900 and under 49600	$29 \times \frac{14}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
49600 and under 56000	$30 \times \frac{15}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
56000 and under 63000	$32 \times \frac{15}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$
63000 and under 70000	$32 \times \frac{15}{20}$	$\frac{13}{20}$	$\frac{9}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$5 \times 5 \times \frac{11}{20}$

MEM.—The Scantlings given in the above Table are intended for Vessels, the length of which does not exceed *eleven times* their dep
For proportions of bread

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.—*18th April, 1901.*

RUDDER.†						Thickness of Upper deck and diameter of bolt fastenings of wood deck. (*a*)			Thickness of wood ceiling in hold, to upper part of bilges.
Sailing Vessels.			Steam Vessels.* (*b*)						
Diam. at the head.	Diam. of pintles.	Section of main piece at heel.	Diameter at the head.	Diameter of pintles.	Section of main piece at heel.	Wood deck.	Diameter of Bolts.	Steel Deck.	
inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
$2\frac{7}{8}$	2	2×2	3	2	2×2	$2\frac{1}{2}$	$\frac{1}{2}$	...	2
3	2	2×2	$3\frac{1}{2}$	2	$2\frac{1}{2}\times2$	3	$\frac{1}{2}$	...	2
$3\frac{1}{4}$	2	2×2	$3\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}\times2\frac{1}{4}$	3	$\frac{1}{2}$	...	2
$3\frac{1}{2}$	2	$2\frac{1}{2}\times2$	4	$2\frac{1}{4}$	$2\frac{3}{4}\times2\frac{1}{4}$	3	$\frac{1}{2}$	$\frac{6}{20}$	2
$3\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}\times2\frac{1}{4}$	$4\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}\times2\frac{1}{2}$	$3\frac{1}{2}$	$\frac{9}{16}$	$\frac{6}{20}$	$2\frac{1}{2}$
4	$2\frac{1}{4}$	$2\frac{3}{4}\times2\frac{1}{4}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\times2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{9}{16}$	$\frac{6}{20}$	$2\frac{1}{2}$
$4\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}\times2\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\times2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{9}{16}$	$\frac{6}{20}$	$2\frac{1}{2}$
$4\frac{1}{2}$	$2\frac{3}{4}$	$3\times2\frac{3}{4}$	$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}\times2\frac{3}{4}$	$3\frac{1}{2}$	$\frac{9}{16}$	$\frac{6}{20}$	$2\frac{1}{2}$
$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}\times2\frac{3}{4}$	5	3	$3\frac{1}{4}\times3$	$3\frac{1}{2}$	$\frac{9}{16}$	$\frac{6}{20}$	$2\frac{1}{2}$
5	3	$3\frac{1}{4}\times3$	$5\frac{1}{4}$	3	$3\frac{1}{2}\times3$	$3\frac{1}{2}$	$\frac{9}{16}$	$\frac{6}{20}$	$2\frac{1}{2}$
$5\frac{1}{4}$	3	$3\frac{1}{2}\times3$	$5\frac{1}{2}$	3	4×3	$3\frac{1}{2}$	$\frac{9}{16}$	$\frac{6}{20}$	$2\frac{1}{2}$
$5\frac{1}{2}$	3	4×3	$5\frac{3}{4}$	3	$4\frac{1}{4}\times3$	4	$\frac{5}{8}$	$\frac{6}{20}$	$2\frac{1}{2}$
6	3	$4\frac{3}{4}\times3$	$6\frac{1}{4}$	$3\frac{1}{4}$	$4\frac{3}{4}\times3\frac{1}{4}$	4	$\frac{5}{8}$	$\frac{6}{20}$	$2\frac{1}{2}$
$6\frac{1}{4}$	$3\frac{1}{4}$	$4\frac{3}{4}\times3\frac{1}{4}$	7	$3\frac{1}{2}$	$5\frac{1}{2}\times3\frac{1}{2}$	4	$\frac{5}{8}$	$\frac{6}{20}$	$2\frac{1}{2}$
$6\frac{3}{4}$	$3\frac{1}{2}$	$5\times3\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{2}$	$6\times3\frac{1}{2}$	4	$\frac{5}{8}$	$\frac{6}{20}$	$2\frac{1}{2}$
7	$3\frac{1}{2}$	$5\frac{1}{2}\times3\frac{1}{2}$	$7\frac{3}{4}$	$3\frac{3}{4}$	$6\frac{1}{2}\times3\frac{3}{4}$	4	$\frac{5}{8}$	$\frac{6}{20}$	$2\frac{1}{2}$
$7\frac{1}{2}$	$3\frac{3}{4}$	$6\times3\frac{3}{4}$	8	4	$6\frac{1}{2}\times4$	4	$\frac{5}{8}$	$\frac{6}{20}$	$2\frac{1}{2}$
$7\frac{1}{2}$	$3\frac{3}{4}$	$6\times3\frac{3}{4}$	$8\frac{1}{2}$	$4\frac{1}{4}$	$6\frac{3}{4}\times4\frac{1}{4}$	4	$\frac{5}{8}$	$\frac{7}{20}$	$2\frac{1}{2}$
8	4	$6\frac{1}{2}\times4$	9	$4\frac{1}{2}$	$7\times4\frac{1}{2}$	4	$\frac{5}{8}$	...	$2\frac{1}{2}$
$8\frac{1}{2}$	$4\frac{1}{2}$	$6\frac{1}{2}\times4\frac{1}{2}$	$9\frac{1}{2}$	$4\frac{3}{4}$	$7\frac{1}{2}\times4\frac{3}{4}$	4	$\frac{5}{8}$	...	$2\frac{1}{2}$
...	...	...	10	5	8×5	4	$\frac{5}{8}$	...	$2\frac{1}{2}$
...	...	...	$10\frac{1}{2}$	$5\frac{1}{4}$	$8\frac{1}{4}\times5\frac{1}{4}$	4	$\frac{5}{8}$	...	$2\frac{1}{2}$
...	...	...	$10\frac{1}{2}$	$5\frac{1}{4}$	$8\frac{1}{4}\times5\frac{1}{4}$	4	$\frac{5}{8}$	...	$2\frac{1}{2}$
...	...	...	11	$5\frac{1}{2}$	$8\frac{1}{2}\times5\frac{1}{2}$	4	$\frac{5}{8}$	...	$2\frac{1}{2}$
...	...	...	11	$5\frac{1}{2}$	$8\frac{1}{2}\times5\frac{1}{2}$	4	$\frac{5}{8}$	...	$2\frac{1}{2}$

from top of keel, see Section 1. *For Vessels which exceed this proportion, see Section* 46 *and Table S* 6.
to length, see Table S 5.

(*a*) When the deck is of Teak, it may be one-sixth less in thickness. Where a steel deck is substituted for a wood one, it is not to be less than as given above, and supported by beams as in the case of steel decks required by Table S 5. When the deck is of steel as required by the Rules, it is to be in thickness as given in Table S 5.

(*b*) The rudder heads of Steam Trawlers to be one-half an inch greater in diameter than is given in the above Table.

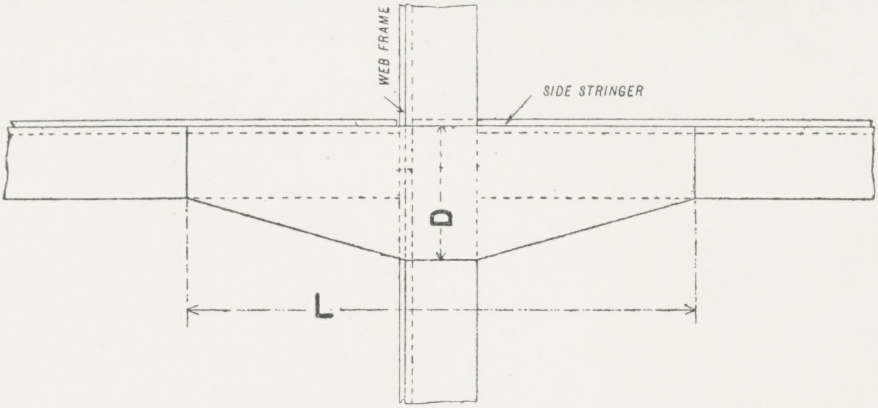
† For Single Plate Rudders, see Table S 3A.

* The diameters of rudder heads for Steam Vessels to be calculated by the following formula, but in no case is the diameter to be less than that given in the above Table:—

$$d = \frac{1}{32}\sqrt[3]{D\times b(2B-b)\times S^2}$$

where d = diameter of rudder head in inches, D = feet draught, P = greatest distance in inches from the centre of pintles to back of rudder. b = the greatest breadth of rudder in inches and S = speed in knots.

FACE ANGLES AND CONNECTING STRAPS FOR WEB FRAMES AND WEB FRAME STRINGERS AND SIDE STRINGER ANGLES IN VESSELS WITH DEEP FRAMING.



FRAME NUMBER.	SINGLE FACE ANGLE ON WEB FRAMES AND WEB FRAME STRINGERS AND SIDE STRINGER ANGLES IN VESSELS WITH DEEP FRAMING.	BUTTSTRAPS FOR WEB FRAME STRINGER.				
		Dimensions.			Rivets.	
		L	D	Thickness.	Number in Straps and Stringer Face Angle.	Number in Straps and Web Frame Face Angle.
	Ins. Ins. Ins.	Inches.	Inches.	Inches.		
52 to 57	$5 \times 3 \times \frac{7}{20}$	24	8	$\frac{8}{20}$	12	4
57 ,, 61	$5 \times 3 \times \frac{8}{20}$	27	9	$\frac{9}{20}$	12	4
61 ,, 65	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	27	9	$\frac{9}{20}$	12	4
65 ,, 68	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	33	10	$\frac{10}{20}$	16	4
68 ,, 71	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	33	10	$\frac{10}{20}$	16	4
71 ,, 73	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	33	10	$\frac{10}{20}$	16	4
73 ,, 76	$5\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	33	10	$\frac{10}{20}$	16	4
76 ,, 80	$6 \times 4 \times \frac{10}{20}$	42	11	$\frac{11}{20}$	20	6
80 ,, 85	$6 \times 4 \times \frac{11}{20}$	42	11	$\frac{11}{20}$	20	6
85 ,, 91	$6 \times 4 \times \frac{12}{20}$	42	11	$\frac{11}{20}$	20	6
91 ,, 97	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{12}{20}$	42	11	$\frac{11}{20}$	20	6
97 ,, 103	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{13}{20}$	45	12	$\frac{12}{20}$	20	6
103 ,, 109	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{14}{20}$	45	12	$\frac{12}{20}$	20	6
109 ,, 115	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{15}{20}$	45	12	$\frac{12}{20}$	20	6
115 ,, 122	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{15}{20}$	45	12	$\frac{12}{20}$	20	6
122 ,, 130	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{15}{20}$	45	12	$\frac{12}{20}$	20	6

NUMBER for regulating the Scantlings.	(a) (f) Diameter of the Head.	Diameter of Main-piece at Heel (if round)	Section of Mainpiece at Heel (if rectangular)	Diameter of Pintles.	ARM AT EACH PINTLE KEYED TO MAINPIECE.				
					Depth and Thickness of Arm at Mainpiece.	Thickness of Arm round Mainpiece.	Depth and Thickness of Arm at Point.	Maximum Distance between Centres of Arms.	Thickness of Single Plate in 20ths of an inch.
	inches.	inches.	inches. (b) (c)	inches.	inches.	inches.	inches	inches.	
Under 2800	3	$2\frac{1}{2}$	$2 \times 2\frac{1}{4}$	2	3×2	$1\frac{3}{8}$	$2\frac{1}{2} \times \frac{3}{4}$	45	15
2800 and under 4100	$3\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{1}{2} \times 2\frac{3}{4}$	2	$3\frac{1}{2} \times 2\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{3}{4} \times \frac{3}{4}$	45	15
4100 and under 5400	$3\frac{3}{4}$	3	$2\frac{1}{2} \times 3$	$2\frac{1}{4}$	$3\frac{3}{4} \times 2\frac{3}{8}$	$1\frac{5}{8}$	$2\frac{3}{4} \times \frac{3}{4}$	48	16
5400 and under 6700	4	3	$2\frac{3}{4} \times 3$	$2\frac{1}{4}$	$4 \times 2\frac{1}{2}$	$1\frac{3}{4}$	$3 \times \frac{7}{8}$	48	16
6700 and under 7900	$4\frac{1}{4}$	$3\frac{1}{4}$	$2\frac{3}{4} \times 3\frac{3}{8}$	$2\frac{1}{2}$	$4\frac{1}{4} \times 2\frac{5}{8}$	$1\frac{7}{8}$	$3 \times \frac{7}{8}$	48	16
7900 and under 9100	$4\frac{1}{2}$	$3\frac{1}{2}$	$3 \times 3\frac{3}{4}$	$2\frac{3}{4}$	$4\frac{1}{2} \times 2\frac{3}{4}$	2	$3\frac{1}{4} \times \frac{7}{8}$	51	17
9100 and under 10300	$4\frac{1}{2}$	$3\frac{1}{2}$	$3 \times 3\frac{3}{4}$	$2\frac{3}{4}$	$4\frac{1}{2} \times 2\frac{3}{4}$	2	$3\frac{1}{4} \times \frac{7}{8}$	51	17
10300 and under 11400	$4\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{4} \times 3\frac{3}{4}$	$2\frac{3}{4}$	$4\frac{3}{4} \times 2\frac{7}{8}$	2	$3\frac{1}{4} \times \frac{7}{8}$	51	17
11400 and under 12600	5	$3\frac{3}{4}$	$3\frac{1}{4} \times 4$	3	5×3	$2\frac{1}{8}$	$3\frac{1}{2} \times 1$	51	17
12600 and under 13800	$5\frac{1}{4}$	4	$3\frac{1}{2} \times 4$	3	$5\frac{1}{4} \times 3\frac{1}{8}$	$2\frac{1}{4}$	$3\frac{1}{2} \times 1$	54	18
13800 and under 15100	$5\frac{1}{2}$	$4\frac{1}{4}$	4×4	3	$5\frac{1}{2} \times 3\frac{1}{8}$	$2\frac{1}{4}$	$3\frac{3}{4} \times 1$	54	18
15100 and under 16500	$5\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{1}{4} \times 4$	3	$5\frac{3}{4} \times 3\frac{1}{4}$	$2\frac{3}{8}$	$3\frac{3}{4} \times 1$	54	18
16500 and under 18000	$6\frac{1}{4}$	$4\frac{3}{4}$	$4\frac{3}{4} \times 4\frac{3}{8}$	$3\frac{1}{4}$	$6\frac{1}{4} \times 3\frac{3}{8}$	$2\frac{3}{8}$	$4 \times 1\frac{1}{8}$	57	19
18000 and under 19700	7	$5\frac{1}{4}$	$5\frac{1}{2} \times 4\frac{5}{8}$	$3\frac{1}{2}$	$7 \times 3\frac{5}{8}$	$2\frac{1}{2}$	$4\frac{1}{2} \times 1\frac{1}{4}$	57	19
19700 and under 21700	$7\frac{1}{4}$	$5\frac{1}{2}$	$6 \times 4\frac{5}{8}$	$3\frac{1}{2}$	$7\frac{1}{4} \times 3\frac{5}{8}$	$2\frac{5}{8}$	$4\frac{1}{2} \times 1\frac{1}{4}$	60	20
21700 and under 24100	$7\frac{3}{4}$	$5\frac{3}{4}$	$6\frac{1}{2} \times 5$	$3\frac{3}{4}$	$7\frac{3}{4} \times 3\frac{7}{8}$	$2\frac{3}{4}$	$4\frac{3}{4} \times 1\frac{1}{4}$	60	20
24100 and under 27000	8	6	$6\frac{1}{2} \times 5\frac{3}{8}$	4	8×4	$2\frac{3}{4}$	$5 \times 1\frac{3}{8}$	60	20
27000 and under 30400	$8\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{3}{4} \times 5\frac{5}{8}$	$4\frac{1}{4}$	$8\frac{1}{2} \times 4\frac{1}{4}$	3	$5 \times 1\frac{3}{8}$	63	21
30400 and under 34300	9	$6\frac{3}{4}$	7×6	$4\frac{1}{2}$	$9 \times 4\frac{3}{8}$	3	$5\frac{1}{4} \times 1\frac{3}{8}$	63	22
34300 and under 38800	$9\frac{1}{2}$	$7\frac{1}{4}$	$7\frac{1}{2} \times 6\frac{3}{8}$	$4\frac{3}{4}$	$9\frac{1}{2} \times 4\frac{1}{2}$	$3\frac{1}{8}$	$5\frac{1}{4} \times 1\frac{3}{8}$	63	22
38800 and under 43900	10	$7\frac{1}{2}$	$8 \times 6\frac{5}{8}$	5	$10 \times 4\frac{5}{8}$	$3\frac{1}{4}$	$5\frac{1}{2} \times 1\frac{1}{2}$	66	22
43900 and under 49600	$10\frac{1}{2}$	8	$8\frac{1}{4} \times 7$	$5\frac{1}{4}$	$10\frac{1}{2} \times 4\frac{3}{4}$	$3\frac{3}{8}$	$5\frac{1}{2} \times 1\frac{1}{2}$	66	22
49600 and under 56000	$10\frac{1}{2}$	8	$8\frac{1}{4} \times 7$	$5\frac{1}{4}$	$10\frac{1}{2} \times 4\frac{3}{4}$	$3\frac{3}{8}$	$5\frac{1}{2} \times 1\frac{1}{2}$	66	22
56000 and under 63000	11	$8\frac{1}{4}$	$8\frac{1}{2} \times 7\frac{1}{4}$	$5\frac{1}{2}$	11×5	$3\frac{1}{2}$	$5\frac{3}{4} \times 1\frac{1}{2}$	66	22
63000 and under 70000	11	$8\frac{1}{4}$	$8\frac{1}{2} \times 7\frac{1}{4}$	$5\frac{1}{2}$	11×5	$3\frac{1}{2}$	$5\frac{3}{4} \times 1\frac{1}{2}$	66	22

ARMS AT AND BETWEEN RUDDER PINTLES.						
Keyed to Mainpiece.		Forged to Mainpiece. Depth of Arms.		Depth and Thickness of Arms at Point.	Maximum Distance between Centres of Arms.	Thickness of Single Plate in 20ths of an inch.
Depth and Thickness of Arms at Mainpiece.	Thickness of Arm round Mainpiece.	With Small Fillet. (d)	With Large Fillet. (e)			
inches.	inches.	inches.	inches.	inches.	inches.	
$3 \times 1\frac{1}{2}$	$1\frac{1}{8}$	5	$4\frac{1}{2}$	$2\frac{1}{2} \times \frac{3}{4}$	26	10
$3\frac{1}{2} \times 1\frac{5}{8}$	$1\frac{1}{8}$	5	$4\frac{1}{2}$	$2\frac{1}{2} \times \frac{3}{4}$	26	10
$3\frac{3}{4} \times 1\frac{3}{4}$	$1\frac{1}{4}$	5	$4\frac{1}{2}$	$2\frac{1}{2} \times \frac{3}{4}$	26	10
$4 \times 1\frac{7}{8}$	$1\frac{3}{8}$	$5\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4} \times \frac{7}{8}$	27	10
$4\frac{1}{4} \times 1\frac{7}{8}$	$1\frac{3}{8}$	$5\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4} \times \frac{7}{8}$	27	12
$4\frac{1}{2} \times 2$	$1\frac{3}{8}$	$5\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4} \times \frac{7}{8}$	27	12
$4\frac{1}{2} \times 2$	$1\frac{3}{8}$	$5\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4} \times \frac{7}{8}$	27	12
$4\frac{3}{4} \times 2\frac{1}{8}$	$1\frac{1}{2}$	$5\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4} \times \frac{7}{8}$	27	12
$5 \times 2\frac{1}{4}$	$1\frac{1}{2}$	6	5	3×1	29	15
$5\frac{1}{4} \times 2\frac{1}{4}$	$1\frac{1}{2}$	6	5	3×1	29	15
$5\frac{1}{2} \times 2\frac{1}{4}$	$1\frac{1}{2}$	6	5	3×1	29	15
$5\frac{3}{4} \times 2\frac{3}{8}$	$1\frac{5}{8}$	6	5	3×1	29	15
$6 \times 2\frac{3}{8}$	$1\frac{5}{8}$	6	5	$3\frac{1}{4} \times 1\frac{1}{8}$	30	18
$6\frac{1}{2} \times 2\frac{3}{4}$	2	$6\frac{1}{2}$	$5\frac{1}{2}$	$3\frac{1}{2} \times 1\frac{1}{4}$	32	18
$6\frac{1}{2} \times 2\frac{3}{4}$	2	$6\frac{1}{2}$	$5\frac{1}{2}$	$3\frac{1}{2} \times 1\frac{1}{4}$	32	18
$6\frac{1}{2} \times 3$	$2\frac{1}{8}$	$6\frac{1}{2}$	$5\frac{1}{2}$	$3\frac{1}{2} \times 1\frac{1}{4}$	32	20
$6\frac{1}{2} \times 3\frac{1}{8}$	$2\frac{1}{4}$	$6\frac{1}{2}$	$5\frac{1}{2}$	$3\frac{3}{4} \times 1\frac{3}{8}$	33	20
$6\frac{1}{2} \times 3\frac{1}{4}$	$2\frac{1}{4}$	7	6	$3\frac{3}{4} \times 1\frac{3}{8}$	35	20
$7 \times 3\frac{1}{2}$	$2\frac{1}{2}$	7	6	$3\frac{3}{4} \times 1\frac{3}{8}$	35	22
$7 \times 3\frac{7}{8}$	$2\frac{3}{4}$	7	6	$3\frac{3}{4} \times 1\frac{3}{8}$	35	22
$7 \times 4\frac{1}{8}$	$2\frac{7}{8}$	7	6	$4 \times 1\frac{1}{2}$	36	22
$7 \times 4\frac{1}{4}$	3	7	6	$4 \times 1\frac{1}{2}$	36	22
$7 \times 4\frac{1}{4}$	3	7	6	$4 \times 1\frac{1}{2}$	36	22
$7\frac{1}{2} \times 4\frac{3}{8}$	$3\frac{1}{8}$	$7\frac{1}{2}$	$6\frac{1}{2}$	$4 \times 1\frac{1}{2}$	38	22
$7\frac{1}{2} \times 4\frac{3}{8}$	$3\frac{1}{8}$	$7\frac{1}{2}$	$6\frac{1}{2}$	$4 \times 1\frac{1}{2}$	38	22

* In Sailing Vessels the diameter of the rudder heads required by Table S 3 to regulate the scantlings for single plate rudders and these scantlings to be in accordance with Table S 3B requirements for rudder heads of the same diameter.

(a) The diameter of the rudder heads for Steam Vessels to be calculated by the following formula, but in no case is the diameter to be less than that given in this Table.

$$d=\tfrac{1}{32}\sqrt[3]{D\times b(2B-b)\times S^2}$$

where d = diameter of rudder-head in inches, D=feet draught, B=the greatest distance in inches from the centre of pintles to back of rudder, and b=the greatest breadth of the rudder in inches and S = speed in knots.

(b) The figures in this column to be the fore and aft dimensions.

(c) The figures in this column to be the athwartship dimensions.

(d) Fillets to arms forged or cast on the mainpiece not to have a less radius than one-fifth of the distance between the arms.

(d) & (e) A vertical groove in depth equal to the thickness of the plate, but not to exceed one inch, to be formed in the mainpiece to receive the fore edge of the plate, except in those cases where the arm fillets have a radius equal to half the distance between the arms, when the groove may be dispensed with.

(f) The rudder heads of Steam Trawlers to be one-half an inch greater in diameter than is given in the above Table.

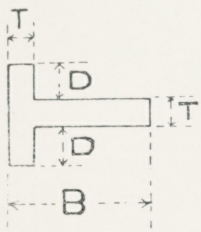
STEEL VESSELS.

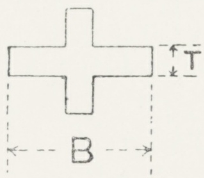
TABLE OF MINIMUM SIZES OF STEERING CHAINS,

Diameter of Rudder Head.	Radius of Quadrant.	Diameter of Chains. (*a*)	Diameter of Rods. (*a*)	BOSS OF QUADRANT.		FORGED IRON QUADRANTS AND TILLERS. Sizes of Arms at two Diameters of			
				Depth.	Outside Diameter.	ONE ARM.	TWO ARMS.	THREE ARMS.	FOUR ARMS.
inches.	feet. inches.	inches.	inches.	inches.	inches.	inches. inches.	inches. inches.	inches. inches.	inches. inches.
3	3 0	$\frac{3}{8}$	$\frac{1}{2}$	3	$5\frac{1}{2}$	$3\frac{1}{4}\times2$			
$3\frac{1}{4}$	3 0	$\frac{3}{8}$	$\frac{1}{2}$	$3\frac{1}{4}$	$5\frac{3}{4}$	$3\frac{1}{4}\times2\frac{1}{4}$			
$3\frac{1}{2}$	3 2	$\frac{7}{16}$	$\frac{9}{16}$	$3\frac{1}{2}$	$6\frac{1}{4}$	$3\frac{1}{2}\times2\frac{1}{2}$			
$3\frac{3}{4}$	3 2	$\frac{7}{16}$	$\frac{9}{16}$	$3\frac{3}{4}$	$6\frac{3}{4}$	$4\times2\frac{1}{2}$			
4	3 4	$\frac{1}{2}$	$\frac{5}{8}$	4	$7\frac{1}{4}$	$4\frac{1}{4}\times2\frac{1}{2}$			
$4\frac{1}{4}$	3 4	$\frac{9}{16}$	$\frac{11}{16}$	$4\frac{1}{4}$	$7\frac{1}{2}$	$4\frac{1}{2}\times2\frac{3}{4}$			
$4\frac{1}{2}$	3 6	$\frac{9}{16}$	$\frac{11}{16}$	$4\frac{1}{2}$	8	$5\times2\frac{3}{4}$	$3\frac{3}{4}\times2\frac{1}{4}$		
$4\frac{3}{4}$	3 6	$\frac{5}{8}$	$\frac{13}{16}$	$4\frac{3}{4}$	$8\frac{1}{2}$	$5\frac{1}{4}\times2\frac{3}{4}$	$4\times2\frac{1}{4}$		
5	3 8	$\frac{5}{8}$	$\frac{13}{16}$	5	9	$5\frac{1}{2}\times3$	$4\frac{1}{4}\times2\frac{1}{2}$		
$5\frac{1}{4}$	3 8	$\frac{11}{16}$	$\frac{14}{16}$	$5\frac{1}{4}$	$9\frac{1}{4}$	$5\frac{3}{4}\times3$	$4\frac{1}{2}\times2\frac{1}{2}$		
$5\frac{1}{2}$	3 10	$\frac{3}{4}$	$\frac{15}{16}$	$5\frac{1}{2}$	$9\frac{3}{4}$	$6\times3\frac{1}{4}$	$4\frac{3}{4}\times2\frac{1}{2}$		
$5\frac{3}{4}$	3 10	$\frac{3}{4}$	$\frac{15}{16}$	$5\frac{3}{4}$	$10\frac{1}{4}$	$6\frac{1}{4}\times3\frac{1}{4}$	$5\times2\frac{1}{2}$		
6	4 0	$\frac{13}{16}$	1	6	$10\frac{3}{4}$	$6\frac{1}{2}\times3\frac{1}{2}$	$5\frac{1}{4}\times2\frac{3}{4}$		
$6\frac{1}{4}$	4 0	$\frac{7}{8}$	$1\frac{1}{16}$	$6\frac{1}{4}$	$11\frac{1}{4}$	$6\frac{3}{4}\times3\frac{1}{2}$	$5\frac{1}{2}\times2\frac{3}{4}$		
$6\frac{1}{2}$	4 2	$\frac{7}{8}$	$1\frac{1}{16}$	$6\frac{1}{2}$	$11\frac{3}{4}$	$7\times3\frac{3}{4}$	$5\frac{1}{2}\times3$		
$6\frac{3}{4}$	4 2	$\frac{15}{16}$	$1\frac{3}{16}$	$6\frac{3}{4}$	12	$7\frac{1}{4}\times3\frac{3}{4}$	$5\frac{3}{4}\times3$		
7	4 4	1	$1\frac{1}{4}$	7	$12\frac{1}{2}$	$7\frac{1}{2}\times4$	$6\times3\frac{1}{4}$		
$7\frac{1}{4}$	4 4	1	$1\frac{1}{4}$	$7\frac{1}{4}$	13	$7\frac{3}{4}\times4\frac{1}{4}$	$6\times3\frac{1}{2}$		
$7\frac{1}{2}$	4 6	$1\frac{1}{16}$	$1\frac{5}{16}$	$7\frac{1}{2}$	$13\frac{1}{2}$	$8\times4\frac{1}{2}$	$6\frac{1}{4}\times3\frac{1}{2}$		
$7\frac{3}{4}$	4 6	$1\frac{1}{8}$	$1\frac{3}{8}$	$7\frac{3}{4}$	14	$8\frac{1}{4}\times4\frac{1}{2}$	$6\frac{1}{4}\times3\frac{3}{4}$		
8	4 8	$1\frac{1}{8}$	$1\frac{3}{8}$	8	$14\frac{1}{2}$	$8\frac{1}{2}\times4\frac{3}{4}$	$6\frac{1}{2}\times4$	$5\frac{3}{4}\times3\frac{1}{2}$	
$8\frac{1}{2}$	5 0	$1\frac{3}{16}$	$1\frac{1}{2}$	$8\frac{1}{2}$	$15\frac{1}{4}$	9×5	7×4	$6\times3\frac{3}{4}$	
9	5 4	$1\frac{1}{4}$	$1\frac{9}{16}$	9	$16\frac{1}{4}$	$9\frac{1}{2}\times5\frac{1}{4}$	$7\frac{1}{2}\times4\frac{1}{4}$	$6\frac{1}{2}\times3\frac{3}{4}$	
$9\frac{1}{2}$	5 8	$1\frac{3}{8}$	$1\frac{11}{16}$	$9\frac{1}{2}$	17	$10\times5\frac{3}{4}$	$8\times4\frac{1}{2}$	7×4	
10	6 0	$1\frac{7}{16}$	$1\frac{3}{4}$	10	18	$10\frac{1}{2}\times6$	$8\frac{1}{2}\times4\frac{1}{2}$	$7\frac{1}{2}\times4$	$7\times3\frac{1}{2}$
$10\frac{1}{2}$	6 4	$1\frac{1}{2}$	$1\frac{7}{8}$	$10\frac{1}{2}$	19	$11\times6\frac{1}{4}$	$9\times4\frac{3}{4}$	8×4	$7\frac{1}{2}\times3\frac{1}{2}$
11	6 8	$1\frac{9}{16}$	$1\frac{15}{16}$	11	$19\frac{3}{4}$	$11\frac{1}{2}\times6\frac{3}{4}$	$9\frac{1}{2}\times5$	$8\frac{1}{4}\times4\frac{1}{2}$	$7\frac{3}{4}\times4$
$11\frac{1}{2}$	7 4	$1\frac{5}{8}$	2	$11\frac{1}{2}$	$20\frac{3}{4}$	12×7	$10\times5\frac{1}{4}$	$8\frac{1}{2}\times5$	$8\times4\frac{1}{4}$
12	8 0	$1\frac{5}{8}$	2	12	$21\frac{1}{2}$	$12\frac{1}{2}\times7\frac{1}{2}$	$10\frac{1}{2}\times5\frac{1}{2}$	9×5	$8\frac{1}{2}\times4\frac{1}{2}$
13	8 0	—	—	13	$23\frac{1}{2}$	$13\frac{1}{2}\times7\frac{1}{2}$	$11\frac{1}{4}\times5\frac{3}{4}$	10×5	$9\times4\frac{1}{2}$
14	8 0	—	—	14	$25\frac{1}{4}$	$14\frac{1}{2}\times8$	12×6	$10\frac{1}{2}\times5\frac{1}{4}$	$9\frac{1}{2}\times4\frac{3}{4}$
15	8 0	—	—	15	27	$15\frac{1}{2}\times8\frac{1}{2}$	$12\frac{3}{4}\times6\frac{1}{2}$	$11\times5\frac{1}{2}$	10×5

CAST STEEL QUADRANT TILLERS.

Rudder head from Centre of Rudder head. **(*b*)**





TWO ARMS. B × T inches.	D inches.	TWO ARMS. B × T inches.	THREE ARMS. B × T inches.
		$6 \times 1\frac{1}{4}$	
		$6\frac{1}{4} \times 1\frac{1}{4}$	
		$6\frac{1}{2} \times 1\frac{3}{8}$	
		$6\frac{3}{4} \times 1\frac{3}{8}$	
		$7 \times 1\frac{5}{8}$	
		$7\frac{1}{4} \times 1\frac{5}{8}$	
		$7\frac{1}{2} \times 1\frac{3}{4}$	
		$7\frac{3}{4} \times 1\frac{3}{4}$	
$8 \times 1\frac{3}{8}$	2	$8 \times 1\frac{3}{4}$	
$8\frac{1}{4} \times 1\frac{1}{2}$	2	$8\frac{1}{4} \times 1\frac{7}{8}$	
$8\frac{1}{2} \times 1\frac{1}{2}$	2	$8\frac{1}{2} \times 1\frac{7}{8}$	
$8\frac{3}{4} \times 1\frac{5}{8}$	2	$8\frac{3}{4} \times 2$	
$9 \times 1\frac{5}{8}$	$2\frac{1}{4}$	9×2	$8 \times 1\frac{3}{4}$
$9\frac{1}{2} \times 1\frac{3}{4}$	$2\frac{1}{4}$	$9\frac{1}{2} \times 2\frac{1}{4}$	$8\frac{1}{2} \times 1\frac{7}{8}$
$10 \times 1\frac{7}{8}$	$2\frac{1}{2}$	$10 \times 2\frac{3}{8}$	$9 \times 1\frac{7}{8}$
$10\frac{1}{2} \times 2$	$2\frac{1}{2}$	$10\frac{1}{2} \times 2\frac{1}{2}$	$9\frac{1}{2} \times 2$
$11 \times 2\frac{1}{8}$	$2\frac{3}{4}$	$11 \times 2\frac{5}{8}$	$10 \times 2\frac{1}{8}$
$11\frac{1}{2} \times 2\frac{1}{4}$	$2\frac{3}{4}$	$11\frac{1}{2} \times 2\frac{3}{4}$	$10\frac{1}{2} \times 2\frac{1}{4}$
$12 \times 2\frac{3}{8}$	3	12×3	$11 \times 2\frac{3}{8}$
$12\frac{1}{2} \times 2\frac{1}{2}$	3	$12\frac{1}{2} \times 3\frac{1}{8}$	$11\frac{1}{2} \times 2\frac{1}{2}$
$13 \times 2\frac{5}{8}$	$3\frac{1}{4}$	$13 \times 3\frac{1}{4}$	$12 \times 2\frac{5}{8}$
$14 \times 2\frac{3}{4}$	$3\frac{1}{2}$	$14 \times 3\frac{1}{2}$	$13 \times 2\frac{3}{4}$
15×3	$3\frac{3}{4}$	$15 \times 3\frac{3}{4}$	14×3
$16 \times 3\frac{1}{4}$	4	16×4	$15 \times 3\frac{1}{4}$

(*a*) Where the radius of quadrant or length of tiller adopted, differs from that given in the Table, the diameter of steering chain is to be calculated from the following formula:—

$$d = \cdot 38 \sqrt{\frac{D^3}{R}};$$

where d = diameter of chain in inches;

D = diameter of rudder head in inches according to Table for rudder heads.

R = radius of quadrant or length of tiller at centre of the chain in inches.

The steering rods to be one-fourth larger in diameter than the chain, or of the corresponding diameter given in the Table for the chain required.

(*b*) The sizes of arms at ends may be reduced to three-fourths of the dimensions given in the Table, and where a quadrant tiller is not keyed to the rudder head, the arms of the same may be of these reduced dimensions throughout their lengths.

The diameters at the centre of the chain of leading block sheaves are not to be less than sixteen times that of the steering chains and the pins of the sheaves are to be not less than twice the diameter of the chains.

Lloyd's Register of British and Foreign Shipping, London.—*26th April*, 1900.

STEEL VESSELS.

Table of Minimum dimensions of

Length of Beam amidships.	UPPER DECK BEAMS AMIDSHIPS (a) IN STEAMERS WITH ONE TIER OF BEAMS ONLY, AND IN ALL SAILING VESSELS. (For Beams at ends *see* Footnote, Table S 4 A.)			UPPER AND SPAR DECK BEAMS AMIDSHIPS (b) IN STEAMERS WITH MORE THAN ONE TIER OF BEAMS. (For Beams at ends *see* Footnote, Table S 4 A.)			MAIN, MIDDLE, LOWER AND ORLOP DECK BEAMS AMIDSHIPS (c) IN STEAMERS. (For Beams at ends *see* Footnote, Table S 4 A.)		
	1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.	1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.	1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.
Feet.	Single Angles. ins. ins. ins.	Single Angles. ins. ins. ins.	Single Angles. ins. ins. ins.	Bulb Plate. ins. ins.	Bulb Plate. ins. ins.	Bulb Plate. ins. ins.	Bulb Plate. ins. ins.	Bulb Plate. ins. ins.	Bulb Plate. ins. ins.
16	$4\frac{1}{2}\times3\times\frac{6}{20}$	$4\frac{1}{2}\times3\times\frac{6}{20}$	$4\times3\times\frac{6}{20}$						
18	$5\times3\times\frac{7}{20}$	$5\times3\times\frac{7}{20}$	$4\frac{1}{2}\times3\times\frac{7}{20}$						
20	$5\frac{1}{2}\times3\times\frac{8}{20}$	$5\frac{1}{2}\times3\times\frac{8}{20}$	$5\times3\times\frac{8}{20}$						
22	$6\times3\times\frac{9}{20}$	$6\times3\times\frac{8}{20}$	$5\frac{1}{2}\times3\times\frac{8}{20}$						
24	Bulb Plate. $6\times\frac{6}{20}$	$6\frac{1}{2}\times3\times\frac{9}{20}$	$6\times3\times\frac{9}{20}$	$6\times\frac{6}{20}$	$5\frac{1}{2}\times\frac{5}{20}$	$5\times\frac{5}{20}$	$7\times\frac{6}{20}$	$6\times\frac{6}{20}$	$5\frac{1}{2}\times\frac{5}{20}$
26	$6\frac{1}{2}\times\frac{6}{20}$	Bulb Plate. $6\times\frac{6}{20}$	$6\frac{1}{2}\times3\times\frac{9}{20}$	$6\frac{1}{2}\times\frac{6}{20}$	$6\times\frac{5}{20}$	$5\times\frac{5}{20}$	$7\times\frac{7}{20}$	$6\frac{1}{2}\times\frac{6}{20}$	$5\frac{1}{2}\times\frac{5}{20}$
28	$7\times\frac{6}{20}$	$7\times\frac{6}{20}$	Bulb Plate. $6\frac{1}{2}\times\frac{6}{20}$	$7\times\frac{6}{20}$	$6\times\frac{6}{20}$	$5\frac{1}{2}\times\frac{5}{20}$	$7\frac{1}{2}\times\frac{8}{20}$	$7\times\frac{6}{20}$	$5\frac{1}{2}\times\frac{6}{20}$
30	$7\frac{1}{2}\times\frac{7}{20}$	$7\times\frac{7}{20}$	$7\times\frac{6}{20}$	$7\times\frac{7}{20}$	$6\frac{1}{2}\times\frac{6}{20}$	$5\frac{1}{2}\times\frac{5}{20}$	$8\times\frac{8}{20}$	$7\times\frac{7}{20}$	$6\times\frac{6}{20}$
32	$8\times\frac{8}{20}$	$7\frac{1}{2}\times\frac{7}{20}$	$7\times\frac{7}{20}$	$7\frac{1}{2}\times\frac{8}{20}$	$7\times\frac{6}{20}$	$5\frac{1}{2}\times\frac{6}{20}$	$8\frac{1}{2}\times\frac{9}{20}$	$7\frac{1}{2}\times\frac{7}{20}$	$6\frac{1}{2}\times\frac{6}{20}$
34	$8\frac{1}{2}\times\frac{8}{20}$	$8\times\frac{7}{20}$	$7\frac{1}{2}\times\frac{7}{20}$	$8\times\frac{8}{20}$	$7\times\frac{7}{20}$	$6\times\frac{6}{20}$	$9\times\frac{9}{20}$	$8\times\frac{8}{20}$	$7\times\frac{6}{20}$
36	$9\times\frac{9}{20}$	$8\frac{1}{2}\times\frac{8}{20}$	$8\times\frac{8}{20}$	$8\frac{1}{2}\times\frac{9}{20}$	$7\frac{1}{2}\times\frac{7}{20}$	$6\frac{1}{2}\times\frac{6}{20}$	$9\frac{1}{2}\times\frac{9}{20}$	$8\frac{1}{2}\times\frac{8}{20}$	$7\times\frac{7}{20}$
38	$9\frac{1}{2}\times\frac{9}{20}$	$9\times\frac{8}{20}$	$8\frac{1}{2}\times\frac{8}{20}$	$9\times\frac{9}{20}$	$8\times\frac{8}{20}$	$7\times\frac{6}{20}$	$10\times\frac{10}{20}$	$8\frac{1}{2}\times\frac{9}{20}$	$7\frac{1}{2}\times\frac{7}{20}$
40	$10\times\frac{10}{20}$	$9\frac{1}{2}\times\frac{9}{20}$	$9\times\frac{8}{20}$	$9\frac{1}{2}\times\frac{10}{20}$	$8\frac{1}{2}\times\frac{8}{20}$	$7\times\frac{7}{20}$	$10\frac{1}{2}\times\frac{10}{20}$	$9\times\frac{9}{20}$	$8\times\frac{8}{20}$
42	$10\frac{1}{2}\times\frac{10}{20}$	$10\times\frac{9}{20}$	$9\times\frac{9}{20}$	$10\times\frac{10}{20}$	$8\frac{1}{2}\times\frac{9}{20}$	$7\frac{1}{2}\times\frac{7}{20}$	$11\times\frac{11}{20}$	$9\frac{1}{2}\times\frac{10}{20}$	$8\frac{1}{2}\times\frac{8}{20}$
44		$10\frac{1}{2}\times\frac{10}{20}$	$10\times\frac{9}{20}$		$9\times\frac{9}{20}$	$8\times\frac{8}{20}$		$10\times\frac{10}{20}$	$9\times\frac{8}{20}$
46		$11\times\frac{10}{20}$	$10\times\frac{10}{20}$		$9\frac{1}{2}\times\frac{10}{20}$	$8\frac{1}{2}\times\frac{8}{20}$		$10\frac{1}{2}\times\frac{10}{20}$	$9\times\frac{9}{20}$
48		$11\frac{1}{2}\times\frac{11}{20}$	$10\frac{1}{2}\times\frac{11}{20}$		$10\times\frac{10}{20}$	$9\times\frac{8}{20}$		$11\times\frac{10}{20}$	$9\frac{1}{2}\times\frac{9}{20}$
50			$11\times\frac{11}{20}$		$10\frac{1}{2}\times\frac{10}{20}$	$9\times\frac{9}{20}$		$11\times\frac{11}{20}$	$10\times\frac{9}{20}$
52					$11\times\frac{10}{20}$	$9\frac{1}{2}\times\frac{9}{20}$		$11\frac{1}{2}\times\frac{11}{20}$	$10\times\frac{10}{20}$
54					$11\times\frac{11}{20}$	$10\times\frac{9}{20}$		$12\times\frac{11}{20}$	$10\frac{1}{2}\times\frac{10}{20}$
56						$10\times\frac{10}{20}$			$11\times\frac{10}{20}$
58						$10\frac{1}{2}\times\frac{10}{20}$			$11\times\frac{11}{20}$
60						$11\times\frac{10}{20}$			$11\frac{1}{2}\times\frac{11}{20}$
62						$11\times\frac{11}{20}$			$12\times\frac{11}{20}$
64						$11\frac{1}{2}\times\frac{11}{20}$			$12\times\frac{12}{20}$

For sizes of angles fitted to bulb plates and for equivalent beams *see* Table S 4A.

BEAMS AT AWNING AND FORECASTLE DECKS AND BRIDGE DECKS EXCEEDING ONE-TENTH THE VESSEL'S LENGTH AND POOP DECKS COVERING ENGINE AND BOILER OPENINGS (*d*.) (For Beams at ends *see* Footnote, Table S 4A.)			BEAMS AT BRIDGE DECKS LESS THAN ONE-TENTH THE VESSEL'S LENGTH, AND POOP DECKS NOT COVERING ENGINE AND BOILER OPENINGS.			HOLD BEAMS (*e*) OF EXTRA STRENGTH.		Length of Beam amidships.
1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.	1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.			
Single Angles. ins. ins. ins.	Single Angles. ins. ins. ins.	Single Angles. ins. ins.	Single Angles. ins. ins. ins.	Single Angles. ins. ins. ins.	Single Angles. ins. ins. ins.	Plate or Bulb Plate ins. ins.	Angles. ins. ins. ins.	Feet.
								16
								18
$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{7}{20}$						20
$5 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{6}{20}$	$4\frac{1}{2} \times 3 \times \frac{6}{20}$	$4 \times 3 \times \frac{6}{20}$			22
$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{7}{20}$	$7 \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$	24
$6 \times 3 \times \frac{9}{20}$	$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{7}{20}$	$5 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$4 \times 3 \times \frac{7}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	26
Bulb Plate. $6 \times \frac{6}{20}$	$6 \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{7}{20}$	$5\frac{1}{2} \times 3 \times \frac{7}{20}$	$5 \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$8 \times \frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	28
$6\frac{1}{2} \times \frac{6}{20}$	$6\frac{1}{2} \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{7}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$4 \times 3 \times \frac{7}{20}$	30
$7 \times \frac{6}{20}$	Bulb Plate. $6 \times \frac{6}{20}$	$6 \times 3 \times \frac{8}{20}$	$6 \times 3 \times \frac{9}{20}$	$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$5 \times 3 \times \frac{7}{20}$	$9 \times \frac{9}{20}$	$4 \times 3\frac{1}{2} \times \frac{7}{20}$	32
$7 \times \frac{7}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$6 \times 3 \times \frac{9}{20}$	Bulb Plate $6 \times \frac{6}{20}$	$6 \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{7}{20}$	$9\frac{1}{2} \times \frac{9}{20}$	$4 \times 4 \times \frac{8}{20}$	34
$7\frac{1}{2} \times \frac{7}{20}$	$7 \times \frac{6}{20}$	$6\frac{1}{2} \times 3 \times \frac{9}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$6\frac{1}{2} \times 3 \times \frac{8}{20}$	$5\frac{1}{2} \times 3 \times \frac{8}{20}$	$10 \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	36
$8 \times \frac{8}{20}$	$7 \times \frac{7}{20}$	Bulb Plate. $6 \times \frac{6}{20}$	$7 \times \frac{7}{20}$	Bulb Plate. $6\frac{1}{2} \times \frac{6}{20}$	$6 \times 3 \times \frac{9}{20}$	$10\frac{1}{2} \times \frac{10}{20}$	$4\frac{1}{2} \times 4 \times \frac{9}{20}$	38
$8\frac{1}{2} \times \frac{8}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$7 \times \frac{6}{20}$	$6\frac{1}{2} \times 3 \times \frac{9}{20}$	$11 \times \frac{11}{20}$	$4\frac{1}{2} \times 4 \times \frac{9}{20}$	40
$9 \times \frac{9}{20}$	$8 \times \frac{8}{20}$	$7 \times \frac{6}{20}$	$8 \times \frac{8}{20}$	$7 \times \frac{7}{20}$	Bulb Plate. $6 \times \frac{6}{20}$	$11\frac{1}{2} \times \frac{11}{20}$	$5 \times 4 \times \frac{9}{20}$	42
	$8\frac{1}{2} \times \frac{8}{20}$	$7 \times \frac{7}{20}$		$7\frac{1}{2} \times \frac{7}{20}$	$6\frac{1}{2} \times \frac{6}{20}$	$12 \times \frac{11}{20}$	$5\frac{1}{2} \times 4 \times \frac{9}{20}$	44
	$8\frac{1}{2} \times \frac{9}{20}$	$7\frac{1}{2} \times \frac{7}{20}$		$8 \times \frac{8}{20}$	$7 \times \frac{6}{20}$	$12 \times \frac{11}{20}$	$6 \times 4 \times \frac{9}{20}$	46
	$9 \times \frac{9}{20}$	$8 \times \frac{8}{20}$		$8\frac{1}{2} \times \frac{8}{20}$	$7 \times \frac{7}{20}$	$13 \times \frac{11}{20}$	$6 \times 4 \times \frac{9}{20}$	48
	$9\frac{1}{2} \times \frac{9}{20}$	$8\frac{1}{2} \times \frac{8}{20}$		$8\frac{1}{2} \times \frac{9}{20}$	$7\frac{1}{2} \times \frac{7}{20}$	$13 \times \frac{12}{20}$	$6 \times 4 \times \frac{9}{20}$	50
	$10 \times \frac{10}{20}$	$8\frac{1}{2} \times \frac{9}{20}$		$9 \times \frac{9}{20}$	$8 \times \frac{8}{20}$	$13 \times \frac{12}{20}$	$6 \times 4 \times \frac{10}{20}$	52
	$10\frac{1}{2} \times \frac{10}{20}$	$9 \times \frac{9}{20}$		$9\frac{1}{2} \times \frac{9}{20}$	$8\frac{1}{2} \times \frac{8}{20}$	$13 \times \frac{12}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{20}$	54
		$9\frac{1}{2} \times \frac{9}{20}$			$8\frac{1}{2} \times \frac{9}{20}$	$13 \times \frac{12}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{20}$	56
		$10 \times \frac{9}{20}$			$9 \times \frac{9}{20}$	$14 \times \frac{12}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{20}$	58
		$10 \times \frac{10}{20}$			$9\frac{1}{2} \times \frac{9}{20}$	$14 \times \frac{13}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{11}{20}$	60
		$10\frac{1}{2} \times \frac{10}{20}$			$10 \times \frac{9}{20}$	$14 \times \frac{13}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{12}{20}$	62
		$11 \times \frac{10}{20}$			$10 \times \frac{10}{20}$	$15 \times \frac{13}{20}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{12}{20}$	64

For footnotes *see* Table S 4A.

BEAMS FITTED TO ALTERNATE FRAMES.					BEAMS FITTED TO EVERY FRAME.	
Bulb Plate. ins. ins.	Double Angles. ins. ins. ins.	Butterley Beams. ins. ins. ins.	Channel Beams. ins. ins. ins. ins.	Single Angles. ins. ins. ins.	Single Angles. ins. ins. ins.	Channel Beams. ins. ins. ins. ins.
		5 × 4 × 5/20	3½ × 3 × 3 × 6/20	5½ × 3 × 7/20	3½ × 2½ × 6/20	
5 × 5/20	2 × 2 × 5/20	5 × 4 × 6/20	4 × 3 × 3 × 6/20	5½ × 3 × 8/20	4 × 2½ × 6/20	
5½ × 5/20	2½ × 2¼ × 5/20	5 × 4 × 7/20	4½ × 3 × 3 × 7/20	6 × 3 × 9/20	4 × 2½ × 6/20	
5½ × 6/20	2½ × 2½ × 5/20	6 × 4½ × 6/20	5 × 3 × 3 × 7/20	6½ × 3 × 9/20	4½ × 3 × 6/20	
				Bulb Angles.*		
6 × 6/20	2½ × 2½ × 5/20	6 × 4½ × 7/20	5 × 3½ × 3½ × 7/20	6½ × 3 × 8/20	5 × 3 × 6/20	
6 × 7/20	2½ × 2½ × 6/20	6 × 4½ × 8/20	5 × 3½ × 3½ × 8/20	6½ × 3 × 9/20	5 × 3 × 7/20	
6½ × 6/20	2½ × 2½ × 6/20	6 × 4½ × 8/20	5½ × 3½ × 3½ × 8/20	7 × 3 × 9/20	5 × 3 × 7/20	
6½ × 7/20	3 × 2½ × 6/20	7 × 5 × 7/20	6 × 3½ × 3½ × 8/20	7½ × 3 × 9/20	5½ × 3 × 7/20	3½ × 3 × 3 × 6/20
7 × 6/20	3 × 2½ × 6/20	7 × 5 × 7/20	6 × 3½ × 3½ × 8/20	7½ × 3 × 9/20	5½ × 3 × 7/20	3½ × 3 × 3 × 6/20
7 × 7/20	3 × 3 × 6/20	7 × 5 × 8/20	6 × 3½ × 3½ × 9/20	7½ × 3 × 10/20	5½ × 3 × 8/20	4 × 3 × 3 × 6/20
7½ × 7/20	3 × 3 × 6/20	7 × 5 × 9/20	6½ × 3½ × 3½ × 9/20	8 × 3 × 10/20	6 × 3 × 8/20	4 × 3 × 3 × 7/20
					Bulb Angles.	
7½ × 8/20	3 × 3 × 6/20	8 × 5 × 8/20	7 × 3½ × 3½ × 9/20	8 × 3½ × 10/20	5 × 3 × 8/20	4 × 3 × 3 × 7/20
8 × 7/20	3 × 3 × 6/20	8 × 5 × 8/20	7 × 3½ × 3½ × 9/20	8 × 3½ × 10/20	5 × 3 × 8/20	4 × 3 × 3 × 7/20
8 × 8/20	3 × 3 × 6/20	8 × 5 × 9/20	7½ × 3½ × 3½ × 9/20	8½ × 3½ × 10/20	5½ × 3 × 8/20	4½ × 3 × 3 × 7/20
8½ × 8/20	3 × 3 × 7/20	8½ × 5¼ × 9/20	8 × 3½ × 3½ × 10/20	9 × 3½ × 11/20	6 × 3 × 8/20	5 × 3 × 3 × 7/20

Where *one row of pillars* is fitted, the *beams at the ends* of the vessel which are less in length than two-thirds that of the bea amidships, may be of the sizes required by the columns numbered 2 in Table S 4; and beams at ends less than half the length the beam amidships may be of the sizes required by columns 3 in Table S 4.

Where *two rows of pillars* are fitted amidships, the athwartship distance between the rows is to be about one-third the breadth of t vessel amidships; and the *beams at the ends* which are less than two-thirds the length of the beam amidships, may be supported one row of pillars, and be of the sizes required by columns 2, and where the lengths of the *beams at the ends* are less than ha the midship beam length the sizes may be as required by columns 3, if supported by one row of pillars.

Where *three rows of pillars* are fitted amidships, the athwartship distances between the rows of pillars is to be about one-fourth t breadth of the vessel amidships, and the beams throughout are to be of the sizes required for beams amidships by columns 3; b where the lengths of the beams are less than three-fourths the length of the beam amidships, two rows of pillars may be fitte and where the *beams at the ends* are less than half the midship beam length, one row of pillars may be fitted.

(c) Lower and orlop deck beams in sailing vessels to be one inch deeper than given in the Table for upper deck beams of the sa length.

Beams fitted to alternate frames.					Beams fitted to every frame.	
Bulb Plate. ins. ins.	Double Angles. ins. ins. ins.	Butterley Beams. ins. ins. ins.	Channel Beams. ins. ins. ins. ins.	Bulb Angles. * ins. ins. ins.	Bulb Angles. ins. ins. ins.	Channel Beams. ins. ins. ins. ins.
$8\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$8\frac{1}{2} \times 5\frac{1}{4} \times \frac{10}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$	$9 \times 3\frac{1}{2} \times \frac{12}{20}$	$6 \times 3 \times \frac{9}{20}$	$5 \times 3 \times 3 \times \frac{8}{20}$
$9 \times \frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$	$9 \times 5\frac{1}{4} \times \frac{9}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$	$9 \times 3\frac{1}{2} \times \frac{12}{20}$	$6 \times 3 \times \frac{9}{20}$	$5 \times 3 \times 3 \times \frac{8}{20}$
$9 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9 \times 5\frac{1}{4} \times \frac{10}{20}$	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$	$9 \times 3\frac{1}{2} \times \frac{13}{20}$	$6\frac{1}{2} \times 3 \times \frac{9}{20}$	$5\frac{1}{2} \times 3 \times 3 \times \frac{8}{20}$
$9\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$9 \times 5\frac{1}{4} \times \frac{11}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$9\frac{1}{2} \times 3\frac{1}{2} \times \frac{13}{20}$	$7 \times 3 \times \frac{9}{20}$	$6 \times 3 \times 3 \times \frac{8}{20}$
$9\frac{1}{2} \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times 6 \times \frac{10}{20}$	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$10 \times 3\frac{1}{2} \times \frac{13}{20}$	$7\frac{1}{2} \times 3 \times \frac{9}{20}$	$6\frac{1}{2} \times 3 \times 3 \times \frac{8}{20}$
$10 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times 6 \times \frac{10}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$10 \times 3\frac{1}{2} \times \frac{14}{20}$	$7\frac{1}{2} \times 3 \times \frac{9}{20}$	$6\frac{1}{2} \times 3 \times 3 \times \frac{8}{20}$
$10 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$10 \times 6 \times \frac{11}{20}$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{13}{20}$	$10\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$	$7\frac{1}{2} \times 3 \times \frac{10}{20}$	$6\frac{1}{2} \times 3 \times 3 \times \frac{9}{20}$
$10\frac{1}{2} \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$10 \times 6 \times \frac{12}{20}$	$10\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{13}{20}$	$11 \times 3\frac{1}{2} \times \frac{14}{20}$	$8 \times 3 \times \frac{10}{20}$	$7 \times 3 \times 3 \times \frac{9}{20}$
$10\frac{1}{2} \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times 6 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$	$11 \times 3\frac{1}{2} \times \frac{15}{20}$	$8 \times 3\frac{1}{2} \times \frac{10}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
$11 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times 6 \times \frac{11}{20}$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$	$11 \times 3\frac{1}{2} \times \frac{15}{20}$	$8 \times 3\frac{1}{2} \times \frac{11}{20}$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$
$11 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$11 \times 6 \times \frac{12}{20}$	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$		$8\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$
$11\frac{1}{2} \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times 6\frac{1}{2} \times \frac{11}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{14}{20}$		$9 \times 3\frac{1}{2} \times \frac{11}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$
$11\frac{1}{2} \times \frac{12}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times 6\frac{1}{2} \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{15}{20}$		$9 \times 3\frac{1}{2} \times \frac{12}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$
$12 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$12 \times 6\frac{1}{2} \times \frac{12}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{15}{20}$		$9 \times 3\frac{1}{2} \times \frac{12}{20}$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$
$12 \times \frac{12}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$	$12 \times 6\frac{1}{2} \times \frac{13}{20}$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{16}{20}$		$9\frac{1}{2} \times 3\frac{1}{2} \times \frac{12}{20}$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$

(**c**) The beams of decks fitted exclusively for the accommodation of passengers may be of the size given for upper deck beams.

(**a**) (**b**) (**c**) and (**d**) The beams at the ends of main or middle, upper and spar deck hatchways, from six to twelve frame spaces in length are to be equal in size to those required at alternate frames for the main or middle deck; and the beams at the ends of hatchways of similar lengths in awning decks and bridge decks are to be of the size required for upper deck beams at alternate frames. Single angles fitted to hatchway end beams are to be equivalent in sectional area to the double angles required by S 4A.

(**e**) These beams are to be formed of a plate with double angle bars on the upper and lower edges. The beam plates and angle bars are to be of the sizes given above, and the broad flanges of the angle bars are to be fitted horizontally. Semi-box beams may be adopted in lieu thereof, formed of bulb plate and single angle bars of the sizes given for upper deck beams, kneed to two consecutive frames with a covering plate of the thickness of the angles.

Strong beams in the machinery space are to have double angles on their upper and lower edges, unless cross tie plating is fitted on them, in which case only single angles need be fitted to the upper and lower edges.

* If beams of bulb angle section are fitted at alternate frames in vessels exceeding 34 feet in breadth, a steel or iron deck should be fitted on these beams.

STEEL VESSELS. Table of Minimum Dimensions of STRINGER

PLATING NUMBERS OF VESSELS. *(See Section 2.)*		2000 to 3000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
Under 10 Depths, or Under 8 Breadths in Length.	Dimensions of Main Stringer Plates, &c.	$20 \times \frac{5}{20}$	$20 \times \frac{6}{20}$	$23 \times \frac{6}{20}$	$26 \times \frac{6}{20}$	$28 \times \frac{6}{20}$	$28 \times \frac{7}{20}$	$30 \times \frac{7}{20}$	$32 \times \frac{7}{20}$	$32 \times \frac{8}{20}$	$34 \times \frac{8}{20}$	$36 \times \frac{8}{2}$
10 to 11 Depths, or 8 to 8½ Breadths.		$22 \times \frac{5}{20}$	$22 \times \frac{6}{20}$	$25 \times \frac{6}{20}$	$28 \times \frac{6}{20}$	$31 \times \frac{6}{20}$	$32 \times \frac{7}{20}$	$34 \times \frac{7}{20}$	$36 \times \frac{7}{20}$	$36 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{2}$
11 to 12 Depths, or 8½ to 9 Breadths.		$24 \times \frac{5}{20}$	$25 \times \frac{6}{20}$	$28 \times \frac{6}{20}$	$31 \times \frac{6}{20}$	$34 \times \frac{6}{20}$	$36 \times \frac{7}{20}$	$38 \times \frac{7}{20}$	$40 \times \frac{7}{20}$	$40 \times \frac{8}{20}$	$42 \times \frac{8}{20}$	$44 \times \frac{8}{2}$
12 to 13 Depths, or 9 to 9½ Breadths.		$24 \times \frac{6}{20}$	$25 \times \frac{7}{20}$	$28 \times \frac{7}{20}$	$31 \times \frac{7}{20}$	$34 \times \frac{7}{20}$	$36 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$40 \times \frac{9}{20}$	$42 \times \frac{9}{20}$	$44 \times \frac{9}{2}$
13 to 14 Depths, or 9½ to 10 Breadths.		$27 \times \frac{6}{20}$	$28 \times \frac{7}{20}$	$31 \times \frac{7}{20}$	$34 \times \frac{7}{20}$	$37 \times \frac{7}{20}$	$40 \times \frac{8}{20}$	$42 \times \frac{8}{20}$	$44 \times \frac{8}{20}$	$44 \times \frac{9}{20}$	$44 \times \frac{9}{20}$ Steel Deck	$46 \times \frac{9}{2}$ $\frac{6}{20}$ for H
14 to 15 Depths, or 10 to 10½ Breadths.		$30 \times \frac{6}{20}$	$31 \times \frac{7}{20}$	$31 \times \frac{8}{20}$	$34 \times \frac{8}{20}$	$37 \times \frac{8}{20}$	$40 \times \frac{9}{20}$	$42 \times \frac{9}{20}$	$44 \times \frac{9}{20}$	$44 \times \frac{10}{20}$	$46 \times \frac{10}{20}$	$48 \times \frac{1}{2}$ Comple
15 to 16 Depths, or over 10½ Breadths.		$33 \times \frac{6}{20}$	$34 \times \frac{7}{20}$	$34 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$44 \times \frac{9}{20}$	$46 \times \frac{9}{20}$	$48 \times \frac{9}{20}$	$48 \times \frac{10}{20}$	$50 \times \frac{10}{20}$	$52 \times \frac{1}{2}$
Ends of Stringer Plates.				$15 \times \frac{5}{20}$	$17 \times \frac{5}{20}$	$19 \times \frac{5}{20}$	$19 \times \frac{6}{20}$	$20 \times \frac{6}{20}$	$22 \times \frac{6}{20}$	$22 \times \frac{7}{20}$	$23 \times \frac{7}{20}$	$24 \times$
Hold and Lower Deck Beam Stringer Plates (extreme breadth).							$20 \times \frac{6}{20}$	$21 \times \frac{6}{20}$	$22 \times \frac{6}{20}$	$23 \times \frac{7}{20}$	$25 \times \frac{7}{20}$	$27 \times$
Ends of Ditto.							$16 \times \frac{5}{20}$	$16 \times \frac{5}{20}$	$17 \times \frac{5}{20}$	$18 \times \frac{6}{20}$	$19 \times \frac{6}{20}$	$21 \times$
Tie Plate on Beams, Fore-and-aft, and Diagonals.				$7 \times \frac{6}{20}$	$7 \times \frac{6}{20}$	$7 \times \frac{6}{20}$	$8 \times \frac{7}{20}$	$8 \times \frac{7}{20}$	$9 \times \frac{7}{20}$	$9 \times \frac{8}{20}$	$10 \times \frac{8}{20}$	$10 \times$
Ends of Ditto.				$7 \times \frac{5}{20}$	$7 \times \frac{5}{20}$	$7 \times \frac{5}{20}$	$8 \times \frac{6}{20}$	$8 \times \frac{6}{20}$	$9 \times \frac{6}{20}$	$9 \times \frac{7}{20}$	$10 \times \frac{7}{20}$	$10 \times$

1. *The depths for proportions to be taken from upper side of keel to top of upper deck beams in one, two, and three deck ships, and to top of main deck in spar and awning deck vessels; and, in spar decked vessels, two depths may be taken off the proportions, so that in a spar-decked vessel of thirteen and under fourteen depths in length, the stringers, &c., may be of the sizes given in the above Table for vessels of eleven and under twelve depths in length; and so on.*

2. In *two decked* vessels the stringer plates indicated with regard to the vessel's proportions in the above Table are to be fitted to the upper deck beams.

3. In *three decked* vessels the stringer plates so indicated in the above Table are to be fitted to both upper and middle deck beams.

PLATES, STEEL DECKS AND TIE PLATES.

TABLE **S 5.**

(For Nos. 27000 to 72000 see Continuation).

13000	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000
36 × $\frac{9}{20}$	40 × $\frac{9}{20}$	42 × $\frac{9}{20}$	42 × $\frac{10}{20}$	44 × $\frac{10}{20}$	46 × $\frac{10}{20}$	48 × $\frac{10}{20}$	50 × $\frac{10}{20}$	52 × $\frac{10}{20}$	54 × $\frac{10}{20}$	54 × $\frac{10}{20}$ Stl Dk $\frac{6}{20}$	56 × $\frac{10}{20}$ ½ Len Amid	Complete 58 × $\frac{10}{20}$ Stl Dk $\frac{6}{20}$
40 × $\frac{9}{20}$	44 × $\frac{9}{20}$	46 × $\frac{9}{20}$	46 × $\frac{10}{20}$	48 × $\frac{10}{20}$	50 × $\frac{10}{20}$	52 × $\frac{10}{20}$	52 × $\frac{10}{20}$ Stl Dk $\frac{6}{20}$	54 × $\frac{10}{20}$ for ½ Lgth	56 × $\frac{10}{20}$ Amidships	58 × $\frac{10}{20}$ Complete	60 × $\frac{10}{20}$ Steel	62 × $\frac{10}{20}$ Deck $\frac{6}{20}$
44 × $\frac{9}{20}$	48 × $\frac{9}{20}$	50 × $\frac{9}{20}$	46 × $\frac{10}{20}$ Steel Deck	48 × $\frac{10}{20}$ $\frac{6}{20}$ for Hlf	50 × $\frac{10}{20}$ Length	52 × $\frac{10}{20}$ Amidships	54 × $\frac{10}{20}$ Complete	56 × $\frac{10}{20}$ Steel	58 × $\frac{10}{20}$ Deck $\frac{6}{20}$	60 × $\frac{10}{20}$ Complete	62 × $\frac{10}{20}$ Steel	64 × $\frac{10}{20}$ Deck $\frac{7}{20}$
44 × $\frac{10}{20}$ Steel Deck	46 × $\frac{10}{20}$ $\frac{6}{20}$ for Hlf	48 × $\frac{10}{20}$ Length	50 × $\frac{10}{20}$ Amidships	52 × $\frac{10}{20}$ Complete	54 × $\frac{10}{20}$ Steel	56 × $\frac{10}{20}$ Deck $\frac{6}{20}$	58 × $\frac{10}{20}$	60 × $\frac{10}{20}$	62 × $\frac{10}{20}$ Complete	64 × $\frac{10}{20}$ Steel	66 × $\frac{10}{20}$ Deck $\frac{7}{20}$	68 × $\frac{10}{20}$
46 × $\frac{10}{20}$ Len Amids	48 × $\frac{10}{20}$ Complete	50 × $\frac{10}{20}$ Steel	52 × $\frac{10}{20}$ Deck $\frac{6}{20}$	54 × $\frac{10}{20}$	58 × $\frac{10}{20}$	60 × $\frac{10}{20}$	62 × $\frac{10}{20}$ Complete	64 × $\frac{10}{20}$ Steel	66 × $\frac{10}{20}$ Deck $\frac{7}{20}$	68 × $\frac{10}{20}$	70 × $\frac{10}{20}$	Cmpl Steel 70 × $\frac{10}{20}$ Deck $\frac{8}{20}$
50 × $\frac{10}{20}$ Steel	52 × $\frac{10}{20}$ Deck $\frac{6}{20}$	54 × $\frac{10}{20}$	56 × $\frac{10}{20}$	58 × $\frac{10}{20}$ Complete	62 × $\frac{10}{20}$ Steel	64 × $\frac{10}{20}$ Deck $\frac{7}{20}$	66 × $\frac{10}{20}$	68 × $\frac{10}{20}$	70 × $\frac{10}{20}$ Com	70 × $\frac{10}{20}$ plete	70 × $\frac{10}{20}$ Steel	72 × $\frac{10}{20}$ Deck $\frac{8}{20}$
54 × $\frac{10}{20}$	56 × $\frac{10}{20}$	58 × $\frac{10}{20}$	60 × $\frac{10}{20}$	62 × $\frac{10}{20}$	64 × $\frac{10}{20}$	66 × $\frac{10}{20}$ Complete	68 × $\frac{10}{20}$ Steel Deck	70 × $\frac{10}{20}$ $\frac{7}{20}$	70 × $\frac{10}{20}$ Complete	72 × $\frac{10}{20}$ Steel Deck	72 × $\frac{10}{20}$ $\frac{8}{20}$	Cpl Stl Up Dk $\frac{8}{20}$ 52 × $\frac{10}{20}$ and MdlDk $\frac{7}{20}$
24 × $\frac{8}{20}$	26 × $\frac{8}{20}$	28 × $\frac{8}{20}$	28 × $\frac{8}{20}$	29 × $\frac{8}{20}$	30 × $\frac{8}{20}$	31 × $\frac{8}{20}$	32 × $\frac{8}{20}$	33 × $\frac{8}{20}$	35 × $\frac{8}{20}$	36 × $\frac{8}{20}$	36 × $\frac{8}{20}$	37 × $\frac{8}{20}$
28 × $\frac{8}{20}$	29 × $\frac{8}{20}$	30 × $\frac{8}{20}$	31 × $\frac{9}{20}$	32 × $\frac{9}{20}$	33 × $\frac{9}{20}$	34 × $\frac{9}{20}$	35 × $\frac{9}{20}$	37 × $\frac{9}{20}$	38 × $\frac{9}{20}$	39 × $\frac{9}{20}$	40 × $\frac{9}{20}$	41 × $\frac{9}{20}$
22 × $\frac{7}{20}$	23 × $\frac{7}{20}$	24 × $\frac{7}{20}$	24 × $\frac{8}{20}$	25 × $\frac{8}{20}$	26 × $\frac{8}{20}$	26 × $\frac{8}{20}$	27 × $\frac{8}{20}$	28 × $\frac{8}{20}$	29 × $\frac{8}{20}$	30 × $\frac{8}{20}$	31 × $\frac{8}{20}$	32 × $\frac{8}{20}$
10 × $\frac{9}{20}$	11 × $\frac{9}{20}$	12 × $\frac{9}{20}$	12 × $\frac{10}{20}$	13 × $\frac{10}{20}$	13 × $\frac{10}{20}$	13 × $\frac{10}{20}$	14 × $\frac{10}{20}$	14 × $\frac{10}{20}$	15 × $\frac{10}{20}$	15 × $\frac{10}{20}$	15 × $\frac{10}{20}$	16 × $\frac{10}{20}$
10 × $\frac{8}{20}$	11 × $\frac{8}{20}$	12 × $\frac{8}{20}$	12 × $\frac{8}{20}$	13 × $\frac{8}{20}$	13 × $\frac{8}{20}$	13 × $\frac{8}{20}$	14 × $\frac{8}{20}$	14 × $\frac{8}{20}$	15 × $\frac{8}{20}$	15 × $\frac{8}{20}$	15 × $\frac{8}{20}$	16 × $\frac{8}{20}$

4. In *spar decked* vessels the stringer plates given in the above Table are to be fitted to the main deck beams; and the stringer plates required for the spar deck beams are to be the breadth of, and may be $\frac{1}{20}$ of an inch less in thickness than the stringer plates given on the upper line of the Table for vessels of the same plating number, and may be reduced at their ends $\frac{1}{20}$ of an inch in thickness, before and abaft the half length amidships, and to the breadth given for the ends of the main deck stringer plate in the Table.

5. In *awning decked* vessels the stringer plates given in the above Table are to be fitted to the main deck beams, and the stringer plates for the awning deck beams are to be as given in Table S 2 A.

6. *All stringer plates* are to maintain their midship breadth for one-half the vessel's length amidships; from thence the breadth may be gradually reduced to that given above for the ends of the vessel.

STEEL VESSELS.

PLATING NUMBERS OF VESSELS. *(See Section 2.)*	27000	28000	29000	31000	32000	34000	35000	36000	38000	39000
Dimensions of Main Stringer Plates &c. Under 10 depths, or Under 8 Breadths in Length.	$60 \times \frac{10}{20}$ Complete	$62 \times \frac{10}{20}$ Stl Dk $\frac{6}{20}$	$65 \times \frac{10}{20}$	$68 \times \frac{10}{20}$ Complete	$70 \times \frac{10}{20}$ Steel Deck	$72 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $72 \times \frac{10}{20}$ Deck $\frac{8}{20}$	ComplSteel Up Dk $\frac{7}{20}$ & $57 \times \frac{10}{20}$ Mid Dk $\frac{7}{20}$ ½ Lgth	Cmpl Steel $58 \times \frac{10}{20}$ Middle	Upper $59 \times \frac{10}{20}$ Deck
10 to 11 Depths or 8 to 8½ Breadths,	$64 \times \frac{10}{20}$	$66 \times \frac{10}{20}$ Complete	$68 \times \frac{10}{20}$ Steel	$70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	$72 \times \frac{10}{20}$	Cmpl Steel $72 \times \frac{10}{20}$ Deck $\frac{8}{20}$	Compl Steel Up Dk $\frac{7}{20}$ & $56 \times \frac{10}{20}$ Mid Dk $\frac{7}{20}$ ½ Lgth	Cmpl Steel $57 \times \frac{10}{20}$ Middle	Upper and $58 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $59 \times \frac{10}{20}$
11 to 12 Depths, or 8½ to 9 Breadths.	$66 \times \frac{10}{20}$ Complete	$68 \times \frac{10}{20}$ Steel	$70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	$72 \times \frac{10}{20}$ Compl Steel	$72 \times \frac{10}{20}$ Deck $\frac{8}{20}$	Cmpl Steel $56 \times \frac{10}{20}$ Middle	Upper $57 \times \frac{10}{20}$ Deck	and $58 \times \frac{10}{20}$ $\frac{7}{20}$	Cmpl Steel $59 \times \frac{10}{20}$ and	Upper $60 \times \frac{10}{20}$ Middle
12 to 13 Depths, or 9 to 9½ Breadths,	Cmp Steel $70 \times \frac{10}{20}$ Deck $\frac{7}{20}$	$70 \times \frac{10}{20}$ Complete	$72 \times \frac{10}{20}$ Steel Deck	$72 \times \frac{10}{20}$ $\frac{8}{20}$	Compl Steel $56 \times \frac{10}{20}$ and Middle	Upper $57 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $58 \times \frac{10}{20}$ and Middle	Up Dk $\frac{8}{20}$ $59 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $60 \times \frac{10}{20}$ Middle	Upper $61 \times \frac{10}{20}$ Deck
13 to 14 Depths, or 9½ to 10 Breadths.	$70 \times \frac{10}{20}$ Complete	$72 \times \frac{10}{20}$ Steel Deck	$72 \times \frac{10}{20}$ $\frac{8}{20}$	Cmpl Steel $55 \times \frac{10}{20}$ and Middle	Up Dk $\frac{8}{20}$ $56 \times \frac{10}{20}$ Deck $\frac{7}{20}$	Cmpl Steel $57 \times \frac{10}{20}$ Middle	Upper $58 \times \frac{10}{20}$ Deck	and $59 \times \frac{10}{20}$ $\frac{8}{20}$	Cmpl Steel $60 \times \frac{10}{20}$ and	Upper $61 \times \frac{10}{20}$ Middle Dk
14 to 15 Depths, or 10 to 10½ Breadths.	Compl Steel $72 \times \frac{10}{20}$ Deck $\frac{8}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ and Mid Dk	Up Dk $\frac{8}{20}$ $55 \times \frac{10}{20}$ $\frac{7}{20}$ thick	Cmpl Steel $56 \times \frac{10}{20}$ Middle	Upper and $57 \times \frac{10}{20}$ Deck $\frac{8}{20}$	Cmpl Steel $58 \times \frac{10}{20}$ and	Upper $59 \times \frac{10}{20}$ Middle Dk	Deck $\frac{9}{20}$ $60 \times \frac{10}{20}$ $\frac{8}{20}$	Cmpl Steel $61 \times \frac{10}{20}$ Middle	Upper $61 \times \frac{11}{20}$ Deck $\frac{9}{20}$
15 to 16 Depths, or over 10½ Breadths.	CmpStl Up Dk $\frac{8}{20}$ $53 \times \frac{10}{20}$ and Mdl Dk $\frac{7}{20}$	Cmpl Steel $54 \times \frac{10}{20}$ Middle Dk	Upper and $55 \times \frac{10}{20}$ $\frac{8}{20}$ thick							
Ends of Stringer Plates.	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$41 \times \frac{8}{20}$	$42 \times \frac{8}{20}$	$43 \times \frac{8}{20}$	$44 \times \frac{8}{20}$	$45 \times \frac{9}{20}$	$45 \times \frac{9}{20}$	$46 \times \frac{9}{20}$	$47 \times \frac{9}{20}$
Hold and Lower Deck Beam Stringer Plates (extreme breadth).	$42 \times \frac{9}{20}$	$43 \times \frac{9}{20}$	$44 \times \frac{9}{20}$	$45 \times \frac{9}{20}$	$46 \times \frac{9}{20}$	$47 \times \frac{9}{20}$	$48 \times \frac{9}{20}$	$50 \times \frac{9}{20}$	$51 \times \frac{9}{20}$	$52 \times \frac{9}{20}$
Ends of ditto.	$33 \times \frac{8}{20}$	$33 \times \frac{8}{20}$	$34 \times \frac{8}{20}$	$35 \times \frac{8}{20}$	$36 \times \frac{8}{20}$	$36 \times \frac{8}{20}$	$37 \times \frac{8}{20}$	$38 \times \frac{8}{20}$	$40 \times \frac{8}{20}$	$41 \times \frac{8}{20}$
Tie Plates on Beams, Fore-and-aft, and Diagonals.	$16 \times \frac{10}{20}$	$17 \times \frac{10}{20}$	$17 \times \frac{10}{20}$	$18 \times \frac{10}{20}$	$18 \times \frac{10}{20}$	$19 \times \frac{10}{20}$	$19 \times \frac{10}{20}$	$20 \times \frac{10}{20}$	$20 \times \frac{10}{20}$	$21 \times \frac{10}{20}$
Ends of ditto.	$16 \times \frac{8}{20}$	$17 \times \frac{8}{20}$	$17 \times \frac{8}{20}$	$18 \times \frac{8}{20}$	$18 \times \frac{8}{20}$	$19 \times \frac{8}{20}$	$19 \times \frac{8}{20}$	$20 \times \frac{8}{20}$	$20 \times \frac{8}{20}$	$21 \times \frac{8}{20}$

7. Where a reduction of $\frac{2}{20}$ths of an inch from the midship thickness is allowed for the ends, the stringer plates may be reduced $\frac{1}{20}$th of an inch in thickness for one-eighth of the vessel's length before and abaft the half length amidships, and from thence to the ends they may be reduced to the thickness required at ends.

8. Where there is a *steel deck* prescribed either for the entire length of the vessel, or for half the length amidships, it is to be fitted to the upper deck beams in two-decked vessels. In three-decked vessels and spar-decked vessels it may be fitted either to the upper or middle deck beams.

9. In way of a *steel deck* or *half-steel deck*, the stringer plates may be reduced in width to one inch for every seven feet of the length of the vessel, but the thickness is to be as given above, and at the ends of the vessel the stringer plates to be in accordance with the Table for "ends of stringer plates." Where more than one steel deck is required the stringer plates are to be of the breadth and thickness given in the Table.

10. Where a *steel deck* is prescribed in the Table to be fitted for one half the vessel's length amidships, it is to be maintained the full breadth of the vessel for that length, and then tapered gradually into the stringer plates for one-eighth the vessel's length at each end.

40000	42000	44000	46000	48000	50000	52000	54000	57000	60000	64000	68000	72000
and 60 × $\frac{10}{20}$ $\frac{7}{20}$ thick	Cmpl Steel 60 × $\frac{11}{20}$ and	Upper Dck 62 × $\frac{11}{20}$ Middle Dk	$\frac{8}{20}$ thick 64 × $\frac{11}{20}$ $\frac{7}{20}$ thick	Cmpl Steel 66 × $\frac{11}{20}$ Middle	Upper 68 × $\frac{11}{20}$ Deck	and 70 × $\frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel 72 × $\frac{11}{20}$ and	Upper 74 × $\frac{11}{20}$ Middle Dk	Deck $\frac{9}{20}$ 76 × $\frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel 78 × $\frac{11}{20}$ Middle	Upper 80 × $\frac{11}{20}$ Deck	and 82 × $\frac{11}{20}$ $\frac{9}{20}$
Upper Dk 60 × $\frac{10}{20}$ Deck	$\frac{8}{20}$ and 60 × $\frac{11}{20}$ $\frac{7}{20}$ thick	Middle 62 × $\frac{11}{20}$	Cmpl Steel 64 × $\frac{11}{20}$ Middle	Upper 66 × $\frac{11}{20}$ Deck	and 68 × $\frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel 70 × $\frac{11}{20}$ and	Upper Dk 72 × $\frac{11}{20}$ Middle Dk	$\frac{9}{20}$ 74 × $\frac{11}{20}$ $\frac{8}{20}$	Cmpl Steel 76 × $\frac{11}{20}$ Middle	Upper 78 × $\frac{11}{20}$ Deck	and 80 × $\frac{11}{20}$ $\frac{9}{20}$	3 Dks $\frac{10}{20}$ 82 × $\frac{11}{20}$ $\frac{9}{20}$ & $\frac{7}{20}$
Deck $\frac{8}{20}$ 60 × $\frac{11}{20}$ Deck $\frac{7}{20}$	Cmpl Steel 62 × $\frac{11}{20}$ Middle	Upper 64 × $\frac{11}{20}$ Deck $\frac{8}{20}$	and 66 × $\frac{11}{20}$ thick	Cmpl Steel 68 × $\frac{11}{20}$ and	Upper Dk 70 × $\frac{11}{20}$ Middle Dk	$\frac{9}{20}$ 72 × $\frac{11}{20}$ $\frac{8}{20}$	74 × $\frac{11}{20}$	Cmpl Steel 76 × $\frac{11}{20}$ Middle Dk	Upper and 78 × $\frac{11}{20}$ $\frac{9}{20}$	80 × $\frac{11}{20}$	Cmpl Steel 80 × $\frac{11}{20}$ Md Dk $\frac{9}{20}$	UpDk $\frac{10}{20}$ 82 × $\frac{11}{20}$ Lr Dk $\frac{7}{20}$
and 61 × $\frac{11}{20}$ $\frac{8}{20}$ thick	Cmpl Steel 63 × $\frac{11}{20}$ and Middle	Upper 65 × $\frac{11}{20}$ Deck $\frac{8}{20}$	Deck $\frac{9}{20}$ 67 × $\frac{11}{20}$ thick	69 × $\frac{11}{20}$	71 × $\frac{11}{20}$ Cmpl Steel	73 × $\frac{11}{20}$ Upper and	75 × $\frac{11}{20}$ Middle Dk	77 × $\frac{11}{20}$ $\frac{9}{20}$	Cmpl Steel 78 × $\frac{11}{20}$ and	Upper Dk 80 × $\frac{11}{20}$ Lower	$\frac{10}{20}$ Middle 82 × $\frac{11}{20}$ Deck $\frac{7}{20}$	Deck $\frac{9}{20}$ 82 × $\frac{11}{20}$ thick
Deck $\frac{9}{20}$ 61 × $\frac{11}{20}$ $\frac{8}{20}$ thick	Cmpl Steel 63 × $\frac{11}{20}$ Middle	Upper 65 × $\frac{11}{20}$ Deck $\frac{9}{20}$	and 67 × $\frac{11}{20}$ thick	69 × $\frac{11}{20}$	Cmpl Steel 71 × $\frac{11}{20}$ and	Upper Dk 73 × $\frac{11}{20}$ Lower	$\frac{10}{20}$ Middle 75 × $\frac{11}{20}$ Deck $\frac{7}{20}$	Deck $\frac{9}{20}$ 77 × $\frac{11}{20}$ thick	79 × $\frac{11}{20}$			
and 62 × $\frac{11}{20}$ thick	Cmpl Steel 64 × $\frac{11}{20}$ and Lower	UpDk $\frac{10}{20}$ 66 × $\frac{11}{20}$ Deck	Md Dk $\frac{9}{20}$ 68 × $\frac{11}{20}$ $\frac{7}{20}$ thick									
48 × $\frac{9}{20}$	49 × $\frac{9}{20}$	50 × $\frac{9}{20}$	51 × $\frac{9}{20}$	52 × $\frac{9}{20}$	53 × $\frac{9}{20}$	54 × $\frac{9}{20}$	55 × $\frac{9}{20}$	56 × $\frac{9}{20}$	57 × $\frac{9}{20}$	58 × $\frac{9}{20}$	60 × $\frac{9}{20}$	62 × $\frac{9}{20}$
53 × $\frac{10}{20}$	54 × $\frac{10}{20}$	55 × $\frac{10}{20}$	56 × $\frac{10}{20}$	57 × $\frac{10}{20}$	58 × $\frac{10}{20}$	59 × $\frac{10}{20}$	60 × $\frac{10}{20}$	61 × $\frac{10}{20}$	62 × $\frac{10}{20}$	63 × $\frac{10}{20}$	64 × $\frac{10}{20}$	65 × $\frac{10}{20}$
41 × $\frac{8}{20}$	42 × $\frac{8}{20}$	43 × $\frac{8}{20}$	44 × $\frac{8}{20}$	45 × $\frac{8}{20}$	46 × $\frac{8}{20}$	47 × $\frac{8}{20}$	48 × $\frac{8}{20}$	49 × $\frac{8}{20}$	50 × $\frac{8}{20}$	51 × $\frac{8}{20}$	52 × $\frac{8}{20}$	53 × $\frac{8}{20}$
21 × $\frac{10}{20}$	22 × $\frac{10}{20}$	23 × $\frac{10}{20}$	24 × $\frac{10}{20}$	25 × $\frac{10}{20}$	26 × $\frac{10}{20}$	27 × $\frac{10}{20}$	28 × $\frac{10}{20}$	29 × $\frac{10}{20}$	30 × $\frac{10}{20}$	31 × $\frac{10}{20}$	32 × $\frac{10}{20}$	33 × $\frac{10}{20}$
21 × $\frac{8}{20}$	22 × $\frac{8}{20}$	23 × $\frac{8}{20}$	24 × $\frac{8}{20}$	25 × $\frac{8}{20}$	26 × $\frac{8}{20}$	27 × $\frac{8}{20}$	28 × $\frac{8}{20}$	29 × $\frac{8}{20}$	30 × $\frac{8}{20}$	31 × $\frac{8}{20}$	32 × $\frac{8}{20}$	33 × $\frac{8}{20}$

11. *Orlop stringer plates* where required to be fitted, to be of the same thickness as the hold beam stringer plates, and three-fourths the breadth of the same.

12. Diagonal tie plates are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged, and in addition, where the plating number is 15,000 and above, diagonal tie plates are to be fitted all fore and aft on the upper deck.

13. In sailing vessels whose plating number is under 15,000, and in steam vessels not requiring a steel deck, if *diagonal tie plates* be fitted on the beams in sufficient number, and to the satisfaction of the Surveyor, their breadth as given in the Table may be deducted from the breadth given above for the stringer plates amidships, in which case the stringer plates may be reduced in breadth at the ends of the vessel to three-fourths of their breadth amidships.

14. Tie plates on all tiers of beams to be of the same thickness as the stringer plates of their respective decks.

STEEL VESSELS.

Additions beyond the requirements contained in th
to depth than in Vessels for whic

Proportion of Depths to Length.	ITEMS.	PLATING
		UNDER 10450
Above 11 and not exceeding 12	1 Sheerstrake	1 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
	2 Strake below Sheerstrake	2 .. ..
	3 Upper deck Stringer plate	3 .. ..
	4 Middle line Keelson...	4 .. ..
	5 Side Keelson	5 .. ..
	6 Bilge Keelson	6 Add Bulb for $\frac{1}{2}$ length amidships.. .. ..
	7 Bilge Stringer...	7 .. ..
	8 Bilge Plating	8 One Strake increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
Above 12 and not exceeding 13	1 Sheerstrake	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships .. ..
	2 Strake below Sheerstrake	2 .. ..
	3 Upper deck Stringer plate	3 .. ..
	4 Middle line Keelson...	4 .. ..
	5 Side Keelson	5 .. ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships .. ..
	7 Bilge Stringer...	7 .. ..
	8 Bilge Plating	8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
Above 13 and not exceeding 14	1 Sheerstrake	1 Add Doubling 18 inches wide for $\frac{3}{5}$ length amidships.. ..
	2 Strake below Sheerstrake	2 .. ..
	3 Upper deck Stringer Plate	3 .. ..
	4 Middle line Keelson	4 .. ..
	5 Side Keelson	5 Double Angle Keelson to be fitted in all cases .. .. ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships .. ..
	7 Bilge Stringer...	7 Add Bulb for $\frac{1}{2}$ length amidships .. ..
	8 Bilge Plating	8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. ..
Above 14 and not exceeding 15	1 Sheerstrake	1 Add Doubling 20 inches wide for $\frac{3}{4}$ length amidships ..
	2 Strake below Sheerstrake...	2 .. ..
	3 Upper deck Stringer plate	3 .. ..
	4 Middle line Keelson...	4 .. ..
	5 Side Keelson	5 Double Angle Keelson and Bulb all fore and aft .. ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships .. ..
	7 Bilge Stringer...	7 Add Bulb for $\frac{1}{2}$ length & Intercostal for $\frac{1}{2}$ length amidships, or
	8 Bilge Plating	8 One Strake doubled for $\frac{1}{2}$ length amidships in lieu of Intercostal
Above 15 and not exceeding 16	1 Sheerstrake	1 .. ..
	2 Strake below Sheerstrake...	2 .. ..
	3 Second Strake below Sheerstrake	3 .. ..
	4 Upper deck Stringer plate	4 .. ..
	5 Middle line Keelson	5 .. ..
	6 Side Keelson	6 .. ..
	7 Bilge Keelson	7 .. ..
	8 Bilge Stringer...	8 .. ..
	9 Bilge Plating	9 .. ..

1. For all Vessels exceeding in length sixteen depths to the Middle Deck, plans must be submitted for the approval of the Committee for giving the Vessels sufficient additional strength longitudinally ; and all Vessels having a length of thirteen depths and above to the Upper Deck, are to have a bridge extending over the midship half length of the Vessel. *See also Section* 46.

2. Where Bulb plates are required they are to be $\frac{1}{4}$ of an inch in depth for each foot of moulded breadth of the vessel and the thickness should not be less than $\frac{1}{20}$ the depth.

(For Nos. 18700 to 40000 see continuation.)

NUMBERS.

10450 and under 15500	15500 and under 18700
1 Add $\frac{1}{20}$ for $\frac{3}{5}$ length amidships .. 2 .. 3 .. 4 .. 5 .. 6 Add Bulb for $\frac{1}{2}$ length amidships .. 7 .. 8 One Strake increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships ..	1 Add $\frac{1}{20}$ for $\frac{3}{4}$ length amidships .. 2 .. 3 .. 4 .. 5 .. 6 Add Bulb for $\frac{1}{2}$ length amidships .. 7 .. 8 One Strake increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships ..
1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships .. 2 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. 3 .. 4 .. 5 .. 6 Add Bulb for $\frac{3}{5}$ length amidships .. 7 .. 8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships ..	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships .. 2 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. 3 .. 4 .. 5 .. 6 Add Bulb for $\frac{3}{5}$ length amidships .. 7 .. 8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships ..
1 Add Doubling 20 inches wide for $\frac{3}{5}$ length amidships .. 2 .. 3 .. 4 .. 5 Add Intercostal .. 6 Add Bulb for $\frac{3}{5}$ length amidships .. 7 Add Bulb for $\frac{1}{2}$ length where no hold beams .. 8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships ..	1 Add Doubling whole width below Stringer for $\frac{3}{5}$ length amids. 2 .. 3 .. 4 .. 5 .. 6 Add Bulb for $\frac{3}{5}$ length amidships .. 7 Add Intercostal for $\frac{1}{2}$ length amidships, or .. 8 Three Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ length amidships ..
1 Add Doubling whole width below Stringer for $\frac{3}{4}$ length amids. 2 .. 3 .. 4 .. 5 Add Intercostal .. 6 Add Bulb for $\frac{3}{5}$ length amidships .. 7 Add Intercostal for $\frac{1}{2}$ length amidships, or .. 8 One Strake doubled for $\frac{1}{2}$ length amidships ..	1 Add Doubling whole width below Stringer for $\frac{3}{4}$ length amids. 2 .. 3 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. 4 .. 5 .. 6 Add Bulb for $\frac{3}{5}$ length amidships .. 7 Add Intercostal for $\frac{1}{2}$ length amidships, or .. 8 One Strake doubled for $\frac{1}{2}$ length amidships ..
1 Add Doubling whole width below Stringer for $\frac{3}{4}$ length amids. 2 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships .. 3 .. 4 .. 5 .. 6 Add Intercostal .. 7 Add Bulb for $\frac{3}{5}$ length amidships .. 8 Add Intercostal for $\frac{1}{2}$ length amidships, or .. 9 One Strake doubled for $\frac{1}{2}$ length amidships ..	1 Add Doubling whole width for $\frac{3}{4}$ length amidships .. 2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships .. 3 .. 4 .. 5 .. 6 .. 7 Add Intercostal for $\frac{3}{5}$ length amidships .. 8 Add Intercostal for $\frac{1}{2}$ length amidships, or .. 9 One Strake doubled for $\frac{1}{2}$ length amidships ..

3. All vessels, excepting those with an awning deck, whose plating No. exceeds 35,000 and exceeding 16 depths in length taken from the main deck, are to have the whole of the reverse frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee. In the case of awning-decked vessels they are all to extend to the main deck.

4. In the cases of vessels having awning decks, part awning decks or long bridges, the additions on account of proportions required to topsides by the above Table are included in the scantlings given in Table S 2A.

STEEL VESSELS.

Additions beyond the requirements contained in
to depth than in Vessels for wh

Proportion of Depths to Length.	ITEMS.	PLATING 18700 and under 26000	26000 and under 35000
Above 11 and not exceeding 12	1 Sheerstrake	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships .. ..
	2 Strake below Sheerstrake ...	2	2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships .. ..
	3 Upper deck Stringer plate ...	3	3 .. ..
	4 Middle line Keelson	4	4 .. ..
	5 Side Keelson	5	5 Add Bulb for $\frac{1}{2}$ length amidships .. ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships	6 Add Bulb for $\frac{3}{5}$ lgth. & Intcl. for $\frac{1}{2}$ lgth. amids.
	7 Bilge Stringer	7	7 Add Intercostal for $\frac{1}{2}$ length amidships ..
	8 Bilge Plating	8 Two Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ lgth. amids.	8 .. ..
Above 12 and not exceeding 13	1 Sheerstrake	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships	1 Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships .. ..
	2 Strake below Sheerstrake ...	2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships	2 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships .. ..
	3 Upper deck Stringer plate ...	3	3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships .. ..
	4 Middle line Keelson	4	4 .. ..
	5 Side Keelson	5	5 Add Bulb for $\frac{1}{2}$ length amidships .. ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships	6 Add Bulb for $\frac{3}{5}$ lgth. & Intcl. for $\frac{1}{2}$ lgth. amids.
	7 Bilge Stringer	7 Add Intercostal for $\frac{1}{2}$ length amidships, or ..	7 Add Intercostal for $\frac{1}{2}$ length amidships ..
	8 Bilge Plating	8 Three Strakes increased $\frac{1}{20}$ for $\frac{1}{2}$ lgth. amids.	8 .. ..
Above 13 and not exceeding 14	1 Sheerstrake	1 Add Dblng. whole width below Stringer for	1 Add Doubling whole width for $\frac{3}{4}$ lgth. amids.
	2 Strake below Sheerstrake ...	2 .. .. [$\frac{3}{5}$ lgth. amids.	2 .. ..
	3 Upper deck Stringer plate ...	3 Add $\frac{1}{20}$ for $\frac{1}{2}$ length amidships	3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships .. ..
	4 Middle line Keelson	4	4 To be $\frac{1}{4}$ deeper than in Table S 3. .. ..
	5 Side Keelson	5	5 Add Bulb for $\frac{1}{2}$ length amidships .. ..
	6 Bilge Keelson	6 Add Bulb for $\frac{3}{5}$ length amidships	6 Add Bulb for $\frac{3}{5}$ lgth. & Intcl. for $\frac{1}{2}$ lgth. amids.
	7 Bilge Stringer	7 Add Intercostal for $\frac{1}{2}$ length amidships ..	7 Add Intercostal for $\frac{3}{5}$ length amidships ..
	8 Bilge Plating	8	8 .. ..
Above 14 and not exceeding 15	1 Sheerstrake	1 Add Doubling whole width for $\frac{3}{4}$ lgth. amids.	1 Add Doubling whole width for $\frac{3}{4}$ lgth. amids.
	2 Strake below Sheerstrake ...	2	2 Add Doubling whole width for $\frac{1}{2}$ lgth. amids.
	3 Upper deck Stringer plate ...	3 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships	3 Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships .. ..
	4 Middle line Keelson	4 To be $\frac{1}{4}$ deeper than in Table S 3.	4 To be $\frac{1}{4}$ deeper than in Table S 3. ..
	5 Side Keelson	5 Add Bulb for $\frac{1}{2}$ length amidships	5 Add plate Keelson (*a*) for $\frac{1}{2}$ length amids.
	6 Bilge Keelson	6 Add Bulb for $\frac{2}{3}$ length amidships	6 Add Bulb for $\frac{2}{3}$ lgth. & Intcl. for $\frac{3}{5}$ lgth. amids.
	7 Bilge Stringer	7 Add Intercostal for $\frac{1}{2}$ length amidships ..	7 Add Intercostal for $\frac{3}{5}$ length amidships ..
	8 Bilge Plating	8	8 .. ..
Above 15 and not exceeding 16	1 Sheerstrake	1 Add Doubling whole width for $\frac{3}{4}$ lgth. amids.	1 Add Doubling whole width for $\frac{3}{4}$ lgth. amids.
	2 Strake below Sheerstrake ...	2 Add Doubling whole width for $\frac{1}{2}$ lgth. amids.	2 Add Doubling whole width for $\frac{3}{5}$ lgth. amids.
	3 Second Strake below Shrstrake	3	3 .. ..
	4 Upper deck Stringer Plate ...	4 Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships	4 Add Doubling 40 ins. wide for $\frac{1}{2}$ lgth. amids.
	5 Middle line Keelson	5 To be $\frac{1}{4}$ deeper than in Table S 3.	5 To be $\frac{1}{4}$ deeper than in Table S 3. .. ..
	6 Side Keelson	6 Add Bulb for $\frac{1}{2}$ length amidships	6 Add plate Keelson (*b*) for $\frac{1}{2}$ length amids.
	7 Bilge Keelson	7 Add Bulb for $\frac{3}{5}$ lgth. & Intcl. for $\frac{1}{2}$ lgth. amids.	7 Add Bulb for $\frac{2}{3}$ lgth. & Intcl. for $\frac{3}{5}$ lgth. amids.
	8 Bilge Stringer	8 Add Intercostal for $\frac{3}{5}$ length amidships ..	8 Add Intercostal for $\frac{3}{5}$ length amidships ..
	9 Bilge Plating	9	9 .. ..

(*a*) Continuous plate Keelson standing on the floors and attached to Intercostal Keelson plates, having double angles on upper and lower edges of the sizes given in Table S 3, the plate to be of sufficient depth to take the deep flanges of the angles, and to be of the thickness given in Table S 3 for middle line Keelsons.

(*b*) Continuous plate Keelson standing on the floors and attached to Intercostal Keelson plates, having double angles on upper and lower edges of the sizes given in Table S 3, the plate to be three-fourths the depth given in Table S 3 for middle line Keelsons, and of the same thickness.

Rules; for Vessels of greater proportionate length the ordinary Scantlings are provided.

TABLE S 6. *(continued.)*

NUMBERS.

No.	35000 and under 40000	40000 and under 50000
1	Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships	Add $\frac{2}{20}$ for $\frac{3}{4}$ length amidships.
2	Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships	Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships.
3	..	Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships.
4	..	
5	Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships	Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships.
6	Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships.
7	Add Intercostal for $\frac{3}{5}$ length amidships	Add Intercostal for $\frac{3}{5}$ length amidships.
8	..	
1	Add Doubling whole width for $\frac{3}{4}$ length amidships	Add Doubling whole width for $\frac{3}{4}$ length amidships.
2	..	Add $\frac{2}{20}$ for $\frac{1}{2}$ length amidships.
3	Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships	Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships.
4	..	
5	Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships	Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships.
6	Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships.
7	Add Intercostal for $\frac{3}{5}$ length amidships	Add Intercostal for $\frac{3}{5}$ length amidships.
8	..	
1	Add Doubling whole width for $\frac{3}{4}$ length amidships	Add Doubling whole width for $\frac{3}{4}$ length amidships.
2	Add Doubling whole width for $\frac{1}{2}$ length amidships	Add Doubling whole width for $\frac{1}{2}$ length amidships.
3	Add $\frac{2}{20}$ for $\frac{3}{5}$ length amidships	Add Doubling 42 inches wide for $\frac{3}{5}$ length amidships.
4	To be $\frac{1}{4}$ deeper than in Table S 3.	To be $\frac{1}{4}$ deeper than in Table S 3.
5	Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships	Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships.
6	Add Bulb for $\frac{3}{5}$ length and Intercostal for $\frac{1}{2}$ length amidships	Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships.
7	Add Intercostal for $\frac{3}{5}$ length amidships	Add Intercostal for $\frac{3}{5}$ length amidships.
8	..	
1	Add Doubling whole width for $\frac{3}{4}$ length amidships	To be specially considered.
2	Add Doubling whole width for $\frac{1}{2}$ length amidships	
3	Add Doubling 42 inches wide for $\frac{3}{5}$ length amidships	
4	To be $\frac{1}{4}$ deeper than in Table S 3.	
5	Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships	
6	Add plate Keelson (*a*) for $\frac{1}{2}$ length amidships	
7	Add Intercostal for $\frac{3}{5}$ length amidships	
8	..	
1	Add Doubling whole width for $\frac{3}{4}$ length amidships	To be specially considered.
2	Add Doubling whole width for $\frac{3}{5}$ length amidships	
3	Add Doubling whole width for $\frac{1}{2}$ length amidships	
4	Add Doubling 50 inches wide for $\frac{3}{5}$ length amidships	
5	To be $\frac{1}{4}$ deeper than in Table S 3.	
6	Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships	
7	Add plate Keelson (*b*) for $\frac{1}{2}$ length amidships	
8	Add Intercostal for $\frac{3}{5}$ length amidships	
9	..	

5. In lieu of the doubling plates required above, the thickness of the Sheerstrake, the strake next below the sheerstrake, and the upper deck stringer plate may be increased in thickness to afford equivalent strength. In vessels where the plating number is over 28,000, and double butt straps are not required by Section 20, paragraph 8, such straps are to be fitted to the butts of the sheerstrake.

TABLE OF SCANTLINGS

PLATING NUMBERS FOR REGULATING SCANTLINGS.	CENTRE GIRDER IN CELLULAR BOTTOM.				SIDE GIRDERS.			MARGIN PLATE.			FLOOR PLATES IN CELLULAR BOTTOM, AND BRACKETS.			INNER		
	Depth above Top of Keel.	Thickness.			Thickness.			Depth (exclusive of Flange).	Thickness.		Thickness.			Middle Line Strake except in Boiler spa		
					In Holds.						In Holds.				Thickness.	
		Half Length Amidships.	At Ends.	In Boiler Space.	Half Length Amids.	At Ends.	In Boil'r Space	(a)	Clear of Boiler Space.	In Boiler Space.	Half Length Amidships.	At Ends.	In Boiler Space.	Breadth.	Half Length Amidships.	At End
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Under 11000	32	8/20	7/20	10/20	6/20	6/20	8/20	20	6/20	8/20	6/20	6/20	8/20	32	7/20	6/20
11000 and under 12750	33	8/20	7/20	10/20	6/20	6/20	8/20	21½	7/20	9/20	6/20	6/20	8/20	33	8/20	7/20
12750 and under 14600	34	8/20	7/20	10/20	6/20	6/20	8/20	23	7/20	9/20	6/20	6/20	8/20	34	8/20	7/20
14600 and under 16600	35	9/20	8/20	11/20	6/20	6/20	9/20	24	7/20	9/20	7/20	7/20	9/20	35	8/20	7/20
16600 and under 18800	36	9/20	8/20	11/20	7/20	7/20	9/20	25	7/20	9/20	7/20	7/20	9/20	36	8/20	7/20
18800 and under 21200	37	9/20	8/20	11/20	7/20	7/20	9/20	26½	8/20	10/20	7/20	7/20	9/20	37	9/20	8/20
21200 and under 23600	38	9/20	8/20	11/20	7/20	7/20	10/20	28	8/20	10/20	7/20	7/20	10/20	38	9/20	8/20
23600 and under 26000	39	10/20	8/20	12/20	7/20	7/20	10/20	29	8/20	10/20	7/20	7/20	10/20	39	9/20	8/20
26000 and under 28500	40	10/20	8/20	12/20	7/20	7/20	10/20	30½	9/20	11/20	8/20	8/20	10/20	40	9/20	8/20
28500 and under 31000	41	10/20	8/20	12/20	8/20	8/20	10/20	32	9/20	11/20	8/20	8/20	10/20	41	10/20	8/20
31000 and under 33500	42	10/20	8/20	12/20	8/20	8/20	10/20	33	9/20	11/20	8/20	8/20	10/20	42	10/20	8/20
33500 and under 36500	43	10/20	8/20	12/20	8/20	8/20	10/20	34½	10/20	12/20	8/20	8/20	10/20	43	10/20	8/20
36500 and under 39500	44	11/20	9/20	12/20	8/20	8/20	11/20	36	10/20	12/20	8/20	8/20	11/20	44	10/20	8/20
39500 and under 42500	45	11/20	9/20	12/20	8/20	8/20	11/20	37	10/20	12/20	8/20	8/20	11/20	45	10/20	8/20
42500 and under 46000	46	11/20	9/20	12/20	8/20	8/20	11/20	38	10/20	12/20	9/20	8/20	11/20	46	11/20	9/20
46000 and under 49500	47	11/20	9/20	12/20	9/20	8/20	11/20	39	11/20	12/20	9/20	8/20	11/20	47	11/20	9/20
49500 and under 53000	48	12/20	10/20	13/20	9/20	8/20	11/20	40	11/20	12/20	9/20	8/20	11/20	48	11/20	9/20
53000 and under 57000	49	12/20	10/20	13/20	9/20	8/20	11/20	41	11/20	12/20	9/20	8/20	11/20	49	11/20	9/20
57000 and under 61000	50	12/20	10/20	13/20	9/20	8/20	11/20	42	11/20	12/20	9/20	8/20	11/20	50	12/20	9/20
61000 and under 65000	51	13/20	10/20	14/20	9/20	8/20	11/20	43	11/20	12/20	9/20	8/20	11/20	51	12/20	9/20
65000 and under 70000	52	13/20	10/20	14/20	9/20	8/20	11/20	44	11/20	12/20	10/20	8/20	11/20	52	12/20	9/20
70000 and under 75000	53	13/20	10/20	14/20	10/20	8/20	11/20	45	12/20	13/20	10/20	8/20	11/20	53	12/20	9/20
75000 and under 80000	54	14/20	11/20	15/20	10/20	8/20	11/20	46	12/20	13/20	10/20	8/20	11/20	54	12/20	9/20

Number of SIDE GIRDERS in CELLULAR DOUBLE BOTTOMS.

FLOOR PLATES AT EVERY FRAME.			FLOOR PLATES AT ALTERNATE FRAMES.	
The number of Girders to be in accordance with the alternative breadth requiring the greater number.		Number of Side Girders on each side exclusive of Margin Plate.	Plating Number.	Number of Side Girders on each side exclusive of Margin Plate.
Rule Breadth of Vessel.	Breadth of Inner Bottom Amidships.			
feet. / feet.	feet. / feet.			
Under 48	Under 34	1	Under 13000	2
48 and under 60	34 and under 44	2	13000 and under 33000	3
60 and under 72	44 and under 58	3	33000 and under 50000	4

FOR DOUBLE BOTTOMS.

(See Section 24.)

BOTTOM PLATING				DIMENSIONS OF ANGLE BARS (b)			
Thickness.				Angles connecting Centre Girder to Flat Keel Plate.	Angles at top of Centre Girder in Cellular Bottom.	Angles connecting Margin Plate to Outside Plating.	Reversed angles in Cellular Bottom, Side Girder Angles, and Vertical Angles.
In Holds. (c)		In Engine Space.	In Boiler Space including Middle Line Strake				
Half Length Amidships.	At Ends.						
ins.	ins.	ins.	ins.	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.
$\frac{6}{20}$	$\frac{6}{20}$	$\frac{7}{20}$	$\frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$
$\frac{6}{20}$	$\frac{6}{20}$	$\frac{7}{20}$	$\frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{6}{20}$
$\frac{6}{20}$ & $\frac{7}{20}$	$\frac{6}{20}$ & $\frac{7}{20}$	$\frac{7}{20}$	$\frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$	$3 \times 3 \times \frac{7}{20}$
$\frac{6}{20}$ & $\frac{7}{20}$	$\frac{6}{20}$ & $\frac{7}{20}$	$\frac{8}{20}$	$\frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3 \times 3 \times \frac{7}{20}$
$\frac{7}{20}$	$\frac{7}{20}$	$\frac{8}{20}$	$\frac{10}{20}$	$4 \times 4 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3 \times 3 \times \frac{7}{20}$
$\frac{7}{20}$	$\frac{7}{20}$	$\frac{8}{20}$	$\frac{11}{20}$	$4 \times 4 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
$\frac{7}{20}$	$\frac{7}{20}$	$\frac{9}{20}$	$\frac{11}{20}$	$4 \times 4 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
$\frac{7}{20}$ & $\frac{8}{20}$	$\frac{7}{20}$	$\frac{9}{20}$	$\frac{11}{20}$	$4 \times 4 \times \frac{12}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
$\frac{7}{20}$ & $\frac{8}{20}$	$\frac{7}{20}$	$\frac{9}{20}$	$\frac{11}{20}$	$4 \times 4 \times \frac{12}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{20}$
$\frac{7}{20}$ & $\frac{8}{20}$	$\frac{7}{20}$	$\frac{10}{20}$	$\frac{11}{20}$	$4 \times 4 \times \frac{12}{20}$	$4 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$
$\frac{8}{20}$	$\frac{7}{20}$	$\frac{10}{20}$	$\frac{11}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{12}{20}$	$4 \times 4 \times \frac{9}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$
$\frac{8}{20}$	$\frac{7}{20}$	$\frac{10}{20}$	$\frac{12}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{12}{20}$	$4 \times 4 \times \frac{10}{20}$	$4 \times 4 \times \frac{9}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$
$\frac{8}{20}$	$\frac{7}{20}$	$\frac{10}{20}$	$\frac{12}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{12}{20}$	$4 \times 4 \times \frac{10}{20}$	$4 \times 4 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{20}$
$\frac{8}{20}$ & $\frac{9}{20}$	$\frac{7}{20}$ & $\frac{8}{20}$	$\frac{10}{20}$	$\frac{12}{20}$	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{12}{20}$	$4 \times 4 \times \frac{10}{20}$	$4 \times 4 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
$\frac{8}{20}$ & $\frac{9}{20}$	$\frac{7}{20}$ & $\frac{8}{20}$	$\frac{10}{20}$	$\frac{12}{20}$	$5 \times 5 \times \frac{12}{20}$	$4 \times 4 \times \frac{10}{20}$	$4 \times 4 \times \frac{10}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
$\frac{8}{20}$ & $\frac{9}{20}$	$\frac{7}{20}$ & $\frac{8}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$5 \times 5 \times \frac{12}{20}$	$4 \times 4 \times \frac{10}{20}$	$4 \times 4 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
$\frac{9}{20}$	$\frac{8}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$5 \times 5 \times \frac{12}{20}$	$4 \times 4 \times \frac{11}{20}$	$4 \times 4 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
$\frac{9}{20}$	$\frac{8}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$5 \times 5 \times \frac{12}{20}$	$4 \times 4 \times \frac{11}{20}$	$4 \times 4 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$
$\frac{9}{20}$	$\frac{8}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$5 \times 5 \times \frac{13}{20}$	$4 \times 4 \times \frac{11}{20}$	$4 \times 4 \times \frac{11}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$
$\frac{9}{20}$ & $\frac{10}{20}$	$\frac{8}{20}$ & $\frac{9}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$5 \times 5 \times \frac{13}{20}$	$4 \times 4 \times \frac{11}{20}$	$4 \times 4 \times \frac{12}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$
$\frac{9}{20}$ & $\frac{10}{20}$	$\frac{8}{20}$ & $\frac{9}{20}$	$\frac{11}{20}$	$\frac{13}{20}$	$5 \times 5 \times \frac{13}{20}$	$4 \times 4 \times \frac{12}{20}$	$4 \times 4 \times \frac{12}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{10}{20}$
$\frac{9}{20}$ & $\frac{10}{20}$	$\frac{8}{20}$ & $\frac{9}{20}$	$\frac{12}{20}$	$\frac{13}{20}$	$5 \times 5 \times \frac{13}{20}$	$4 \times 4 \times \frac{12}{20}$	$4 \times 4 \times \frac{12}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$
$\frac{10}{20}$	$\frac{9}{20}$	$\frac{12}{20}$	$\frac{13}{20}$	$5 \times 5 \times \frac{14}{20}$	$4 \times 4 \times \frac{12}{20}$	$4 \times 4 \times \frac{12}{20}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{11}{20}$

Where Flanged Plates are adopted for Floors, Brackets, Intercostal Plates, &c., as a substitute for fitting angles on the edges, such Plates are to be $\frac{1}{20}$ of an inch thicker than that given in the Table, and the *faying surface* should not be less than the breadth of the flange of the angle required by the rule.

(*a*) The depth of the Margin Plates may be 10 per cent. less than is required by the above Table when tiers of beams are fitted in accordance with Section 14, or when satisfactory arrangements of Gusset Plates or other efficient ties are fitted to the inner bottom and the bracket knees outside the Margin Plate.

Before the three-fifths length amidships the depth of the Margin Plate may be gradually reduced towards the fore end of the double bottom, where it may be 10 per cent. less than the midship depth. Abaft the three-fifths length, the depth of the Margin Plate may be gradually reduced towards the after end of the tank, where it may be 15 per cent. less than the midship depth.

(*b*) All angle bars in Boiler Space (except those attached to outside plating) to be $\frac{2}{20}$ths of an inch thicker than given in the above Table, where $\frac{10}{20}$ths of an inch in thickness and under, and $\frac{1}{20}$th of an inch thicker where above $\frac{10}{20}$ths of an inch in thickness.

All angles (except margin angles) exceeding $\frac{9}{20}$ths of an inch in thickness, may be reduced $\frac{1}{20}$th of an inch beyond half length amidships.

(*c*) In the columns for Inner Bottom Plating, where two thicknesses are given, they are to be worked in alternate strakes.

TABLE OF RIVETING

PLATING NUMBER.	CENTRE GIRDER. BUTTS.		CONTINUOUS SIDE GIRDERS. BUTTS.		MARGIN PLATE. BUTTS.		ATTACHMENT OF FLOOR PLATES (a).			
							At Centre Girder.		Outside Margin Plate.	
	For Three-fourths Length Amidships.	At Ends.	For Half Length Amidships.	At Ends.	For Half Length Amidships.	At Ends.	In Holds.	In Engine and Boiler Spaces.	Angle Attachment.	Gussets to Floor Brackets (c).
Under 20000	Treble riveted lap.	Double riveted lap.	Double riveted lap.	Double riveted lap.	Double riveted lap.	Double riveted lap.	Single angle.	Double angles.	Single angle.	—
20000 and under 24000	,,	,,	,,	,,	,,	,,	,,	,,	Double angles for half length amidships (b)	—
24000 and under 30000	,,	,,	,,	,,	,,	,,	Double angles for half length amidships.	,,	,,	—
30000 and under 40000	,,	Treble riveted lap.	,,	,,	,,	,,	,,	,,	,,	To every 4th frame.
40000 and under 50000	,,	,,	Treble riveted lap.	,,	Treble riveted lap.	,,	,,	,,	Double angles for threefourths length from collision bulkhead.	To every 3rd frame.
50000 and under 80000	Quadruple riveted lap.	,,	,,	,,	,,	,,	,,	,,	Double angles fore and aft.	To every 2nd frame.

CONNECTION OF FLOORS AND OUTSIDE BRACKETS TO MARGIN PLATES.				
Depth of Margin Plate.			Number of Rivets in each flange of vertical angles.	Diameter of Rivets.
inches.		inches.		inch.
20	and under	24	5	$\frac{3}{4}$
24	and under	28	6	$\frac{3}{4}$
28	and under	30	7	$\frac{3}{4}$
30	and under	35	7	$\frac{7}{8}$
35	and under	40	8	$\frac{7}{8}$
40	and under	44	9	$\frac{7}{8}$
44	and under	50	10	$\frac{7}{8}$

INNER BOTTOM PLATING (*d*).										PLATING NUMBER.
Middle Line Strake.				Remainder of Plating.						
Butts.		Edges.		Butts. (*e*).		Edges.				
						Outside edge of Strake next Middle Line Strake.		Remainder of Edges.		
For Half Length Amidships.	At Ends.	For Half Length Amidships.	At Ends.	For Half Length Amidships.	At Ends.	For Half Length Amidships.	At Ends.	For Half Length Amidships.	At Ends.	
Double riveted lap.	Double riveted lap.	Single riveted lap.	Single riveted lap.	Single riveted lap.	Single riveted lap.	Single riveted lap.	Single riveted lap.	Single riveted lap.	Single riveted lap.	Under 20000
,,	,,	Double riveted lap.	,,	Double riveted lap.	,,	,,	,,	,,	,,	20000 and under 24000
,,	,,	,,	Double riveted lap.	,,	,,	,,	,,	,,	,,	24000 and under 30000
,,	,,	,,	,,	,,	Double riveted lap.	Double riveted lap.	Double riveted lap.	,,	,,	30000 and under 40000
,,	,,	,,	,,	,,	,,	,,	,,	Double riveted lap.	,,	40000 and under 50000
Treble riveted lap.	,,	,,	,,	,,	,,	,,	,,	,,	Double riveted lap.	50000 and under 80000

(*a*) If it is desired to dispense with the double angles, other efficient methods of connection may be submitted for approval.

(*b*) Where tiers of beams are fitted in accordance with Section 14, double angles need not be fitted for half the vessel's length amidships until the plating number is 30,000 or above. When the plating number is 40,000 or above double angles are to be fitted as required by the Table.

(*c*) In high powered vessels, when the Committee may think it necessary, the gusset plates are to be fitted on every frame in way of the machinery space, or a continuous plate may be fitted in lieu of gusset plates.

(*d*) Where double bottoms are formed with girders on top of ordinary floors the butts and edges of the inner bottom plating may be single riveted.

(*e*) The butts of inner bottom plating in engine and boiler spaces are to be double riveted where the plating number is less than 50,000, and treble riveted where the number is 50,000 and under 80,000.

STEEL VESSELS.

SHOWING DIAMETERS AND SPACING OF RIVETS AND

		ins.	ins.	ins.	ins.	ins.	ins.
Thickness of Plates		$\frac{5}{20}$	$\frac{6}{20}$	$\frac{6}{20}$ & $\frac{7}{20}$	$\frac{7}{20}$	$\frac{8}{20}$	$\frac{9}{20}$
Diameter of Rivets		$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
Breadth of Treble riveted Straps in inches		...	...	...	...	$14\frac{1}{4}$	$14\frac{1}{4}$
,, ,, Double ,, ,, ,, ...		8	8	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{4}$
,, ,, Quadruple riveted Butt Laps in inches		...	...	...	...	...	...
,, ,, Treble ,, ,, ,, ,,		...	...	...	...	$7\frac{1}{2}$	$7\frac{1}{2}$
,, ,, Double ,, ,, ,, ,,		$4\frac{1}{4}$	$4\frac{1}{4}$	5	5	5	5
,, ,, Treble ,, Edge Laps ,,		...	...	...	...	...	...
,, ,, Double ,, ,, ,, ,,		$3\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$
,, ,, Single ,, ,, ,, ,,		$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$
MAXIMUM SPACING FROM CENTRE TO CENTRE. $3\frac{1}{2}$ diam. c. to c.	In †butts of outside plating, and of upper, spar and middle deck stringers and the stringers of bridge decks which exceed one third the length of the vessel amidships (except quadruple riveted butt laps)	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{5}{8}$
4 diam. c. to c.	In quadruple riveted butt laps; butts of deck plating, margin plates, girders. lower deck and hold stringers, tie plates, floor plates, and stringer plates on other deck erections; also butts and edges of inner bottom plating	$2\frac{1}{2}$	$2\frac{1}{2}$	3	3	3	3
$4\frac{1}{2}$ diam. c. to c.	In *edges of outside plating (forward and aft), gunwale angle bars, margin plate angles, edges and butts of bulkhead plating ...	$2\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{3}{8}$
5 diam. c. to c.	In flat keel angles, bulkhead frames where caulked, butts and edges of mast plates, and deck plating to beams where single flange beams are fitted to alternate frames	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{3}{4}$	$3\frac{3}{4}$	$3\frac{3}{4}$	$3\frac{3}{4}$
7 diam. c. to c.	In *frames, reversed frames, floors, keelsons, beam angles, deck and hold stringer angles, face angles on web frames and side stringers, bulkhead stiffeners, longitudinal angles on continuous girders, vertical angles connecting floors and girders, and deck plating to beams except where single flange beams are fitted to alternate frames	$4\frac{1}{2}$	$4\frac{1}{2}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$

† In butts connected by single butt straps alternate rivets may be omitted in the back row of treble riveting when the plating number is 20,000 and under; when above this number, the rivets in the back row are not to be more than 5 to $5\frac{1}{4}$ diameters apart from centre to centre. All overlapped butts are to have complete rows of rivets.

* When the rule frame spacing is 26 inches or above, the rivets in the edges of outside plating (forward and aft) are not to exceed 4 diameters apart from centre to centre, and the rivets attaching the outside plating to frames are to be spaced not more than 6 diameters apart from centre to centre.

In deep water ballast tanks above the level of inner bottom and in fore and after peak water ballast tanks, the rivets through frames and outside plating are to be spaced not more than 6 diameters apart from centre to centre.

Before the three-fifths length of a steamer having a tonnage co-efficient of ·78 or having a full form at the fore part, the rivets in the landing edges of the strakes of plating forming the flat of the bottom to be spaced not more than 4 diameters apart from centre to centre. The rivets in the plating and frames in way of the same to be spaced not more than $5\frac{1}{2}$ diameters apart from centre to centre.

Rivets to be $\frac{1}{4}$ of an inch larger in diameter in the Stem, Stern Frame, and Keel, but in no case need these exceed $1\frac{1}{4}$ inches in diameter, and to be spaced 5 diameters apart from centre to centre. In single screw steamers

BREADTHS OF STRAPS, BUTT LAPS AND EDGE LAPS.

ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
$\frac{9}{20}$ & $\frac{10}{20}$	$\frac{10}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$\frac{13}{20}$	$\frac{13}{20}$ & $\frac{14}{20}$	$\frac{14}{20}$	$\frac{15}{20}$	$\frac{16}{20}$	$\frac{17}{20}$	$\frac{17}{20}$ & $\frac{18}{20}$	$\frac{18}{20}$	$\frac{19}{20}$	$\frac{20}{20}$
$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	1	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$
$14\frac{1}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	$16\frac{3}{4}$	19	19	19	19	19	$21\frac{1}{2}$	$21\frac{1}{2}$	$21\frac{1}{2}$	$21\frac{1}{2}$
$9\frac{3}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	$11\frac{1}{4}$	...	...	...	...	...	...	...	...	...
...	12	12	12	12	14	14	14	14	14	16	16	16	16
$7\frac{1}{2}$	9	9	9	9	$10\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	12	12	12	12
5	6	6	6	6	...	...	...	...	...	...	...	...	...
...	...	...	...	$7\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$9\frac{1}{2}$	$9\frac{1}{2}$	$9\frac{1}{2}$	$9\frac{1}{2}$
$4\frac{1}{2}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{4}$	6	6	6	6	6	$6\frac{3}{4}$	$6\frac{3}{4}$	$6\frac{3}{4}$	$6\frac{3}{4}$
$2\frac{1}{2}$	3	3	3	3	...	...	...	...	...	...	...	...	...
$2\frac{5}{8}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4	4	4	4
3	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4	4	4	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$
$3\frac{3}{8}$	4	4	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	...	...	...	...
$3\frac{3}{4}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$4\frac{3}{8}$	5	5	5	5	5	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{5}{8}$
$5\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	7	7	7	7	7	...	...	...	...

above 350 feet in length, the after lengths of shell plating are to be connected to the portion of the stern frame below the boss with three rows of rivets.

Rivets in Side Plate Rudders to be of not less size than those required for the upper edge of garboard strake amidships and be spaced not more than 5 diameters from centre to centre. The rudder plates are to be countersunk, and the rivets are to have full heads and points.

Rivets in Single Plate Rudders are to be of not less size than required for attaching the outside plating to the stern frame, and spaced not more than 5 diameters apart from centre to centre. The rivet holes are to be countersunk both in the rudder plates and the arms, and the rivets are to have full heads and points.

Rivets in the Edges of deck plating are to be spaced not more than 4 to $4\frac{1}{2}$ diameters apart from centre to centre.

STEEL VESSELS.

MINIMUM NUMBER OF RIVETS IN EDGES OF PLATING

	NUMBER OF RIVETS IN									
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Thickness of PLATES	$\frac{5}{20}$	$\frac{6}{20}$	$\frac{6}{20}$ & $\frac{7}{20}$	$\frac{7}{20}$	$\frac{8}{20}$	$\frac{9}{20}$	$\frac{9}{20}$ & $\frac{10}{20}$	$\frac{10}{20}$	$\frac{11}{20}$	$\frac{12}{20}$	$\frac{13}{20}$
Diameter of RIVETS...............	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$
Spacing of FRAMES ......20 ins.	7	7	5	5	5	5	...	...	...	...	...
,, ,, ,, ...21 ,,	...	7	6	6	6	6	6	5	5	...	...
,, ,, ,, ...22 ,,	...	...	6	6	6	6	6	5	5	5	5
,, ,, ,, ...23 ,,	...	...	6	6	6	6	6	5	5	5	5
,, ,, ,, ...24 ,,	...	...	7	7	7	7	7	6	6	6	6
,, ,, ,, ...25 ,,	...	...	...	...	...	...	...	6	6	6	6
,, ,, ,, ...26 ,,	...	...	...	...	...	...	...	...	...	7	7
,, ,, ,, ...27 ,,	...	...	...	...	...	...	...	...	...	7	7
,, ,, ,, ...28 ,,	...	...	...	...	...	...	...	...	...	7	7
,, ,, ,, ...29 ,,	...	...	...	...	...	...	...	...	...	8	8
,, ,, ,, ...30 ,,	...	...	...	...	...	...	...	...	...	8	8
,, ,, ,, ...31 ,,	...	...	...	...	...	...	...	...	...	...	...
,, ,, ,, ...32 ,,	...	...	...	...	...	...	...	...	...	...	...

In single riveted seams one frame rivet is to be fitted through the landing edges at each frame. In double riveted seams one frame rivet is to be fitted through the landing edges at each frame, except where the frames or the edges of the outside plating are joggled when two rivets are to be fitted. In treble riveted seams two frame rivets (the upper and lower) are to be fitted through the landing edges at each frame.

Where the fore and aft flange of the frame does not exceed 3 inches, the rivets attaching the outside plating thereto should not exceed $\frac{7}{8}$ inch in diameter, and where it is $3\frac{1}{2}$ inches wide, they should not exceed 1 inch in diameter.

There are to be at least four rivets in each flange of the angle bars between the frames, which connect the stringer plates and intercostal plates to the outside plating, where the frames are spaced less than 29 inches apart, and where the spacing is 29 inches and not more than 32 inches there are to be five rivets in each flange.

The rivets in the beam knees are to be in number and size as required by Section 13, paragraph 19.

The rivets in the vertical angles connecting floors and outside brackets to margin plates are to be in number and size as required by Table S 7.

The rivets in the connecting straps for web frames and side stringers are to be in number and size as required by Table S 3A.

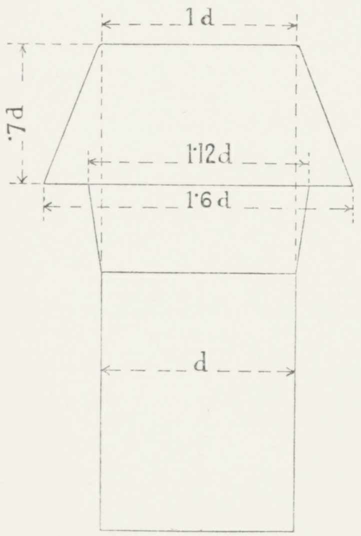
LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.—*23rd April, 1903.*

BETWEEN FRAMES AMIDSHIPS, EXCLUDING RIVETS IN FRAMES.

EACH ROW.

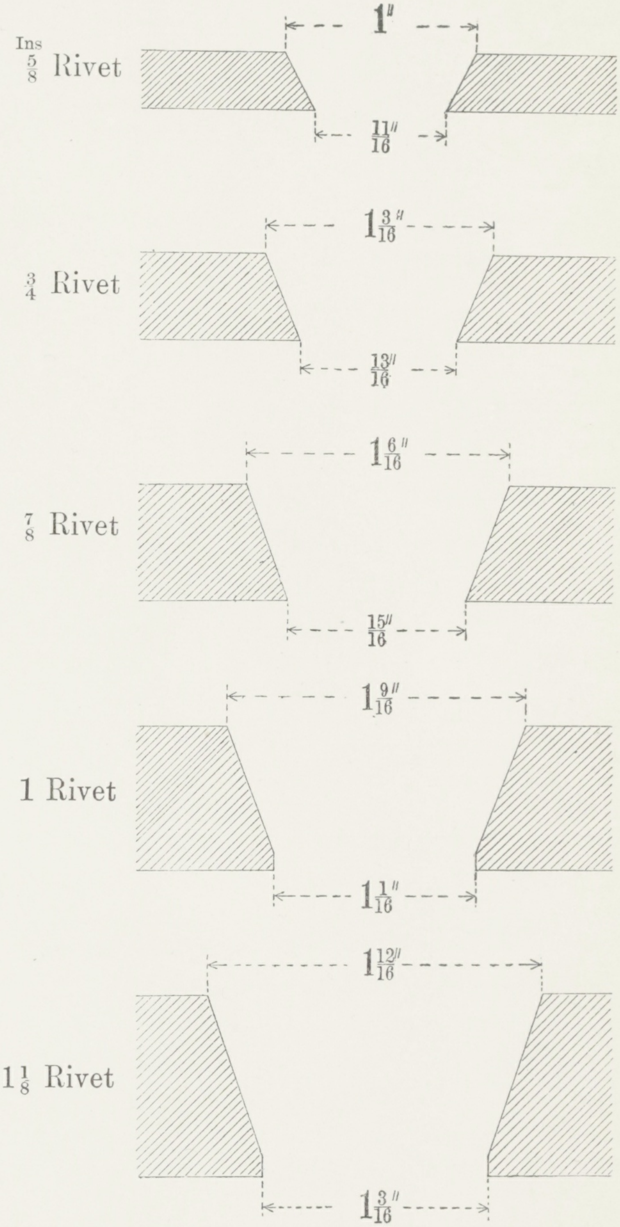
ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
$\frac{13}{20}$ & $\frac{14}{20}$	$\frac{14}{20}$	$\frac{15}{20}$	$\frac{16}{20}$	$\frac{17}{20}$	$\frac{17}{20}$ & $\frac{18}{20}$	$\frac{18}{20}$	$\frac{19}{20}$	$\frac{20}{20}$
1	1	1	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
5	5	5	5	...	...	...	...	...
5	5	5	5	5	...	...	...	...
5	5	5	5	5	...	...	...	...
6	6	6	6	6	5	5	5	5
6	6	6	6	6	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	6	6	6	6
7	7	7	7	7	6	6	6	6
7	7	7	7	7	6	6	6	6
8	8	8	8	8	7	7	7	7

FORM OF RIVET TO BE USED IN OUTSIDE PLATING.



The tapered neck of Rivet to be of suitable length in relation to the thickness of plate in which it is intended to be used.

SIZE OF COUNTERSINK FOR RIVETS IN OUTSIDE PLATING.



The countersink is to extend through the whole thickness of the plate when less than $\frac{14}{20}$ inch in thickness; when $\frac{14}{20}$ inch or above, the countersink is to extend through nine-tenths the thickness of the plate.

Sizes and Scantlings for MASTS AND BOWSPRITS OF

IRON AND STEEL MASTS.

	EXTREME LENGTH (*See Footnote*).	PARTNERS.			HEEL.			HOUNDS.			HEAD.			Sizes of Angle Bars in Masts.	
		Diam.	Thickness.		Diam.	Thickness.		Diam.	Thickness.		Diam.	Thickness.			
			Iron.	Steel.		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.	Iron.	Steel.
	Ft.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
	48	16	5/16	6/20	13	4/16	5/20	13½	4/16	5/20	11	3/16	3/16	...	...
Two Plates in the Round.	51	17	5/16	6/20	13½	4/16	5/20	14	4/16	5/20	11½	4/16	5/20	...	...
	54	18	5/16	6/20	14	4/16	5/20	15	4/16	5/20	12	4/16	5/20	...	...
	57	19	6/16	7/20	15	5/16	6/20	15½	5/16	6/20	12½	4/16	5/20	...	...
	60	20	6/16	7/20	16	5/16	6/20	16½	5/16	6/20	13½	5/16	6/20	...	...
	63	21	6/16	7/20	16½	5/16	6/20	17½	5/16	6/20	14	5/16	6/20	...	...
	66	22	6/16	7/20	17	5/16	6/20	18½	5/16	6/20	14½	5/16	6/20	...	...
	69	23	6/16	7/20	18	5/16	6/20	19	5/16	6/20	15½	5/16	6/20	...	...
	72	24	6/16	7/20	19	5/16	6/20	20	5/16	6/20	16	5/16	6/20	...	...
Three Plates in the Round.	75	25	7/16	8/20	19½	6/16	7/20	21	6/16	7/20	16½	6/16	7/20	...	...
	78	26	7/16	8/20	20	6/16	7/20	21½	6/16	7/20	17½	6/16	7/20	...	...
	81	27	8/16	9/20	21	6/16	7/20	22½	6/16	7/20	18	6/16	7/20	...	...
	84	28	8/16	9/20	22	6/16	7/20	23	6/16	7/20	18½	6/16	7/20	3½ × 3 × 7/16	3½ × 3 × 8/20
	87	29	8/16	9/20	22½	6/16	7/20	24	6/16	7/20	19½	6/16	7/20	4 × 3 × 7/16	4 × 3 × 8/20
	90	30	8/16	9/20	23	7/16	8/20	25	7/16	8/20	20	6/16	7/20	4 × 3 × 8/16	4 × 3 × 9/20
	93	31	9/16	10/20	24	7/16	8/20	26	7/16	8/20	20½	6/16	7/20	4½ × 3 × 8/16	4½ × 3 × 9/20
	96	32	9/16	10/20	25	7/16	8/20	26½	7/16	8/20	21	6/16	7/20	5 × 3 × 8/16	5 × 3 × 9/20

FOOTNOTE.—The length for regulating the scantlings of the mast

RULES FOR THE CONSTRUCTION OF IRON

1. If Iron be used in the construction of masts, bowsprits, and yards, it is to be of good malleable quality quite free from surface or other defects, and to stand a tensile strain of 20 tons to the square inch and the following bending tests when cold without fracture:—

THICKNESS OF PLATES	TO BEND COLD THROUGH AN ANGLE OF	
	With the Grain.	Across the Grain.
9/16	25°	8°
8/16	30°	11°
7/16	37°	13°
6/16	47°	15°
5/16	55°	17°
4/16	65°	20°
3/16	70°	25°

2. The plates to be bent over a slab, the corner of which should be rounded with a radius of half an inch.

3. If Steel be adopted it is to be of the quality required for ship plates and subjected to the same tests.

4. LOWER MASTS.—The plating to be of the thickness, and the plates arranged as in the Table. The seams to be double riveted; in masts of less length than 84 feet, the edges may be single riveted provided angle bars be fitted to the satisfaction of the Committee. The butts below the mast partners in masts, and those inside the wedging of bowsprits, might be double riveted, the remainder should be treble riveted.

5. The buttstraps in all cases should be $\frac{1}{16}$ of an inch thicker than the plates they connect, in iron masts; in steel masts the buttstraps should be $\frac{1}{20}$ of an inch thicker than the plates in double riveted butts and $\frac{2}{20}$ thicker in treble riveted butts. The buttstraps would be better to be fitted on the outside of the masts and bowsprit.

6. The mast and bowsprit plates should be doubled all round in way of the wedging, or otherwise efficiently strengthened; where masts are wedged at the lower deck, the doubling should extend from below the lower deck to above the upper deck.

7. The heels of all masts and their steps should be efficiently strengthened. The cheeks of masts should be stiffened by angles or cope iron on their foremost edges; or by some other approved plan.

8. Where two plates in the round are adopted instead of three the iron is to be of such superior quality as to admit of its being bent to the required form, without being unduly heated and without fracture, and in all such cases the masts should be additionally stiffened by 3 angles as provided for in the Tables

Lloyd's Register of British & Foreign Shipping, London.—28th April, 1892.

CHEEKS.			
Th'kn'ss of Plate.		Sizes of Angle Bar.	
Irn.	Stl.	Iron.	Steel.
ins.	ins.	ins.	ins.
$\frac{7}{16}$	$\frac{8}{20}$	$3\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$	$3\frac{1}{2} \times 2\frac{1}{2} \times \frac{7}{20}$
$\frac{7}{16}$	$\frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$
$\frac{7}{16}$	$\frac{8}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4 \times 3 \times \frac{7}{16}$	$4 \times 3 \times \frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4 \times 3 \times \frac{7}{16}$	$4 \times 3 \times \frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4 \times 3 \times \frac{7}{16}$	$4 \times 3 \times \frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$	$4\frac{1}{2} \times 3 \times \frac{8}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\frac{1}{2} \times 3 \times \frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{9}{20}$
$\frac{8}{16}$	$\frac{9}{20}$	$4\frac{1}{2} \times 3 \times \frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{9}{20}$
$\frac{9}{16}$	$\frac{10}{20}$	$5 \times 3 \times \frac{8}{16}$	$5 \times 3 \times \frac{9}{20}$
$\frac{9}{16}$	$\frac{10}{20}$	$5 \times 3 \times \frac{9}{16}$	$5 \times 3 \times \frac{10}{20}$
$\frac{9}{16}$	$\frac{10}{20}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$	$5 \times 3\frac{1}{2} \times \frac{10}{20}$
$\frac{10}{16}$	$\frac{11}{20}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$	$5 \times 3\frac{1}{2} \times \frac{10}{20}$
$\frac{10}{16}$	$\frac{11}{20}$	$5\frac{1}{2} \times 4 \times \frac{10}{16}$	$5\frac{1}{2} \times 4 \times \frac{11}{20}$
$\frac{10}{16}$	$\frac{11}{20}$	$6 \times 4 \times \frac{10}{16}$	$6 \times 4 \times \frac{11}{20}$
$\frac{11}{16}$	$\frac{12}{20}$	$6 \times 4 \times \frac{10}{16}$	$6 \times 4 \times \frac{11}{20}$
$\frac{11}{16}$	$\frac{12}{20}$	$6 \times 4 \times \frac{10}{16}$	$6 \times 4 \times \frac{11}{20}$

IRON AND STEEL BOWSPRITS.

LENGTH OUTSIDE BED.	BED.			HEEL.			CAP.			Sizes of Angle Bar.	
	Diam.	Th'kn'ss		Diam.	Th'kn'ss		Diam.	Th'kn'ss			
		Irn.	Stl.		Irn.	Stl.		Irn	Stl.	Iron.	Steel.
Ft.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
14	$16\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	14	$\frac{5}{16}$	$\frac{6}{20}$	12	$\frac{4}{16}$	$\frac{5}{20}$	$2\frac{1}{2} \times 2 \times \frac{5}{16}$	$2\frac{1}{2} \times 2 \times \frac{6}{20}$
15	$17\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	15	$\frac{5}{16}$	$\frac{6}{20}$	$12\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	$2\frac{1}{2} \times 2 \times \frac{5}{16}$	$2\frac{1}{2} \times 2 \times \frac{6}{20}$
16	19	$\frac{5}{16}$	$\frac{6}{20}$	16	$\frac{5}{16}$	$\frac{6}{20}$	13	$\frac{5}{16}$	$\frac{6}{20}$	$3 \times 2 \times \frac{5}{16}$	$3 \times 2 \times \frac{6}{20}$
17	20	$\frac{6}{16}$	$\frac{7}{20}$	17	$\frac{6}{16}$	$\frac{7}{20}$	14	$\frac{5}{16}$	$\frac{6}{20}$	$3 \times 2 \times \frac{5}{16}$	$3 \times 2 \times \frac{6}{20}$
18	$21\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	18	$\frac{6}{16}$	$\frac{7}{20}$	15	$\frac{5}{16}$	$\frac{6}{20}$	$3 \times 2\frac{1}{2} \times \frac{5}{16}$	$3 \times 2\frac{1}{2} \times \frac{6}{20}$
19	23	$\frac{6}{16}$	$\frac{7}{20}$	19	$\frac{6}{16}$	$\frac{7}{20}$	16	$\frac{5}{16}$	$\frac{6}{20}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{7}{20}$
20	$24\frac{1}{2}$	$\frac{7}{16}$	$\frac{8}{20}$	20	$\frac{6}{16}$	$\frac{7}{20}$	$16\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$
21	$25\frac{1}{2}$	$\frac{7}{16}$	$\frac{8}{20}$	21	$\frac{6}{16}$	$\frac{7}{20}$	$17\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{7}{20}$
22	$26\frac{1}{2}$	$\frac{7}{16}$	$\frac{8}{20}$	22	$\frac{6}{16}$	$\frac{7}{20}$	$18\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$4 \times 3 \times \frac{7}{16}$	$4 \times 3 \times \frac{8}{20}$
23	28	$\frac{8}{16}$	$\frac{9}{20}$	23	$\frac{7}{16}$	$\frac{8}{20}$	19	$\frac{6}{16}$	$\frac{7}{20}$	$4 \times 3\frac{1}{2} \times \frac{7}{16}$	$4 \times 3\frac{1}{2} \times \frac{8}{20}$
24	29	$\frac{8}{16}$	$\frac{9}{20}$	24	$\frac{7}{16}$	$\frac{8}{20}$	20	$\frac{6}{16}$	$\frac{7}{20}$	$4 \times 3\frac{1}{2} \times \frac{7}{16}$	$4 \times 3\frac{1}{2} \times \frac{8}{20}$
25	30	$\frac{8}{16}$	$\frac{9}{20}$	25	$\frac{7}{16}$	$\frac{8}{20}$	21	$\frac{6}{16}$	$\frac{7}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
26	$31\frac{1}{2}$	$\frac{8}{16}$	$\frac{9}{20}$	26	$\frac{7}{16}$	$\frac{8}{20}$	$21\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$
27	33	$\frac{8}{16}$	$\frac{9}{20}$	27	$\frac{7}{16}$	$\frac{8}{20}$	22	$\frac{6}{16}$	$\frac{7}{20}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{9}{20}$

to be taken, in all cases, from the cap to the top of the keelson.

AND STEEL MASTS, BOWSPRITS, AND YARDS.

9. All masts of 84 feet length and above, to be fitted with angles properly shifted and extending the whole length of the mast. If the plates be arranged as described in the Tables, there should be an angle bar fitted to each plate in the round, of the size given in the Table.

10. All bowsprits exceeding 28 inches in diameter should have a vertical diaphragm plate extending from within the wedging to the gammoning, connected by continuous single angle bars to the upper and lower parts of the bowsprit, and two additional angle bars of the size given in the Table; and bowsprits 28 inches in diameter and under, to have an angle bar at the centre of each plate extending the whole length of the bowsprit.

11. The diameter of the lower masts at the cap to be in no case less than that of the topmast at this place, or of the lower topsail yard.

12. The attention of the Surveyors is to be specially directed to the fittings connected with the masts and rigging, in order to ensure the workmanship, material, and sizes of the same being efficient.

13. The mizenmasts for barques may be reduced one-fifth in diameter from that given in the Table, and the plating to be not less than the thickness corresponding to the diameters.

14. Where a Steamer is intended to be fitted with masts or a bowsprit for auxiliary purposes, they may be one-eighth less in diameter than prescribed by Table; and when a mast of a steamer is to carry fore and aft sail only, the diameter may be one-fifth less than given in the Table. The seams of these masts may be single riveted.

15. When pole masts are fitted, the length of the lower mast, in determining the diameter and thickness of plating, should be taken from the heel to the cap band, so as to include the head, as in an ordinary mast; and in sailing vessels these masts to be additionally strengthened by angles from below the lower yard to the topmast cap, or compensating strength furnished. The cheek plates in pole masts may be of the same thickness as the mast plates at the hounds.

16. The eye-bolts, hoops, cleats and bands, are to be of the best description of wrought iron.

17. Any deviations from these Rules and Tables must be submitted for the consideration of the Committee.

Sizes and Scantlings for YARDS and TOPMASTS of SAILING VESSELS

YARDS.

Length Cleated.	Centre.			First Quarter.			Second Quarter.			Third Quarter.			Ends at Cleats.		
	Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.	
		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.		Iron.	Steel
Feet.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
32	8	$\frac{3}{16}$	$\frac{3}{16}$	$7\frac{7}{8}$	$\frac{3}{16}$	$\frac{3}{16}$	$7\frac{1}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	6	$\frac{3}{16}$	$\frac{3}{16}$	4	$\frac{2}{16}$	$\frac{2}{16}$
36	9	$\frac{3}{16}$	$\frac{3}{16}$	$8\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$8\frac{1}{8}$	$\frac{3}{16}$	$\frac{3}{16}$	$6\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$4\frac{1}{2}$	$\frac{2}{16}$	$\frac{2}{16}$
40	10	$\frac{3}{16}$	$\frac{3}{16}$	$9\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	9	$\frac{3}{16}$	$\frac{3}{16}$	$7\frac{1}{2}$	$\frac{3}{16}$	$\frac{3}{16}$	5	$\frac{2}{16}$	$\frac{2}{16}$
44	11	$\frac{3}{16}$	$\frac{3}{16}$	$10\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	10	$\frac{3}{16}$	$\frac{3}{16}$	$8\frac{1}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$5\frac{1}{2}$	$\frac{2}{16}$	$\frac{2}{16}$
48	12	$\frac{4}{16}$	$\frac{5}{20}$	$11\frac{3}{4}$	$\frac{4}{16}$	$\frac{5}{20}$	$10\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	9	$\frac{3}{16}$	$\frac{3}{16}$	6	$\frac{2}{16}$	$\frac{2}{16}$
52	13	$\frac{4}{16}$	$\frac{5}{20}$	$12\frac{5}{8}$	$\frac{4}{16}$	$\frac{5}{20}$	$11\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$9\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$6\frac{1}{2}$	$\frac{2}{16}$	$\frac{2}{16}$
56	14	$\frac{4}{16}$	$\frac{5}{20}$	$13\frac{5}{8}$	$\frac{4}{16}$	$\frac{5}{20}$	$12\frac{5}{8}$	$\frac{4}{16}$	$\frac{5}{20}$	$10\frac{1}{2}$	$\frac{3}{16}$	$\frac{3}{16}$	7	$\frac{2}{16}$	$\frac{2}{16}$
60	15	$\frac{4}{16}$	$\frac{5}{20}$	$14\frac{5}{8}$	$\frac{4}{16}$	$\frac{5}{20}$	$13\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	$11\frac{1}{4}$	$\frac{3}{16}$	$\frac{3}{16}$	$7\frac{1}{2}$	$\frac{2}{16}$	$\frac{2}{16}$
64	16	$\frac{5}{16}$	$\frac{6}{20}$	$15\frac{5}{8}$	$\frac{5}{16}$	$\frac{6}{20}$	$14\frac{3}{8}$	$\frac{5}{16}$	$\frac{6}{20}$	12	$\frac{4}{16}$	$\frac{5}{20}$	8	$\frac{3}{16}$	$\frac{3}{16}$
68	17	$\frac{5}{16}$	$\frac{6}{20}$	$16\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	$15\frac{1}{4}$	$\frac{5}{16}$	$\frac{6}{20}$	$12\frac{3}{4}$	$\frac{4}{16}$	$\frac{5}{20}$	$8\frac{1}{2}$	$\frac{3}{16}$	$\frac{3}{16}$
72	18	$\frac{5}{16}$	$\frac{6}{20}$	$17\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	$16\frac{1}{4}$	$\frac{5}{16}$	$\frac{6}{20}$	$13\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	9	$\frac{3}{16}$	$\frac{3}{16}$
76	19	$\frac{6}{16}$	$\frac{7}{20}$	$18\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	$17\frac{1}{8}$	$\frac{5}{16}$	$\frac{6}{20}$	$14\frac{1}{4}$	$\frac{4}{16}$	$\frac{5}{20}$	$9\frac{1}{2}$	$\frac{3}{16}$	$\frac{3}{16}$
80	20	$\frac{6}{16}$	$\frac{7}{20}$	$19\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	18	$\frac{5}{16}$	$\frac{6}{20}$	15	$\frac{4}{16}$	$\frac{5}{20}$	10	$\frac{3}{16}$	$\frac{3}{16}$
84	21	$\frac{7}{16}$	$\frac{8}{20}$	$20\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	19	$\frac{5}{16}$	$\frac{6}{20}$	$15\frac{3}{4}$	$\frac{5}{16}$	$\frac{6}{20}$	$10\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$
88	22	$\frac{7}{16}$	$\frac{8}{20}$	$21\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$19\frac{3}{4}$	$\frac{5}{16}$	$\frac{6}{20}$	$16\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	11	$\frac{4}{16}$	$\frac{5}{20}$
92	23	$\frac{7}{16}$	$\frac{8}{20}$	$22\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$20\frac{3}{4}$	$\frac{6}{16}$	$\frac{7}{20}$	$17\frac{1}{4}$	$\frac{5}{16}$	$\frac{6}{20}$	$11\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$
96	24	$\frac{7}{16}$	$\frac{8}{20}$	$23\frac{3}{8}$	$\frac{6}{16}$	$\frac{7}{20}$	$21\frac{5}{8}$	$\frac{6}{16}$	$\frac{7}{20}$	18	$\frac{5}{16}$	$\frac{6}{20}$	12	$\frac{4}{16}$	$\frac{5}{20}$

Lloyd's Register of British and Foreign Shipping, London.—14th December, 1893.

TABLE 10.

and FULL-RIGGED STEAM VESSELS.

TOPMASTS.

Length.	Heel.			Lower Part of Head.			Head.		
	Diameter.	Thickness.		Diameter.	Thickness.		Diameter.	Thickness.	
		Iron.	Steel.		Iron.	Steel.		Iron.	Steel.
Feet.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
32	12	$\frac{4}{16}$	$\frac{5}{20}$	$10\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	9	$\frac{3}{16}$	$\frac{3}{16}$
34	$12\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	11	$\frac{4}{16}$	$\frac{5}{20}$	$9\frac{1}{2}$	$\frac{3}{16}$	$\frac{3}{16}$
36	13	$\frac{4}{16}$	$\frac{5}{20}$	$11\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	10	$\frac{3}{16}$	$\frac{3}{16}$
38	14	$\frac{4}{16}$	$\frac{5}{20}$	$12\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	$10\frac{1}{2}$	$\frac{3}{16}$	$\frac{3}{16}$
40	$14\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	13	$\frac{4}{16}$	$\frac{5}{20}$	11	$\frac{3}{16}$	$\frac{3}{16}$
42	15	$\frac{5}{16}$	$\frac{6}{20}$	$13\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	$11\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$
44	16	$\frac{5}{16}$	$\frac{6}{20}$	14	$\frac{4}{16}$	$\frac{5}{20}$	12	$\frac{4}{16}$	$\frac{5}{20}$
46	$16\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	$14\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$	$12\frac{1}{2}$	$\frac{4}{16}$	$\frac{5}{20}$
48	17	$\frac{6}{16}$	$\frac{7}{20}$	15	$\frac{5}{16}$	$\frac{6}{20}$	13	$\frac{5}{16}$	[illegible]/20
50	18	$\frac{6}{16}$	$\frac{7}{20}$	16	$\frac{5}{16}$	$\frac{6}{20}$	$13\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$
52	$18\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$16\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	14	$\frac{5}{16}$	$\frac{6}{20}$
54	19	$\frac{6}{16}$	$\frac{7}{20}$	17	$\frac{5}{16}$	$\frac{6}{20}$	$14\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$
56	20	$\frac{6}{16}$	$\frac{7}{20}$	18	$\frac{5}{16}$	$\frac{6}{20}$	15	$\frac{5}{16}$	$\frac{6}{20}$
58	$20\frac{1}{2}$	$\frac{6}{16}$	$\frac{7}{20}$	$18\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$	$15\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$
60	21	$\frac{6}{16}$	$\frac{7}{20}$	19	$\frac{5}{16}$	$\frac{6}{20}$	16	$\frac{5}{16}$	$\frac{6}{20}$
62	22	$\frac{6}{16}$	$\frac{7}{20}$	20	$\frac{5}{16}$	$\frac{6}{20}$	$16\frac{1}{2}$	$\frac{5}{16}$	$\frac{6}{20}$
64	23	$\frac{6}{16}$	$\frac{7}{20}$	21	$\frac{5}{16}$	$\frac{6}{20}$	17	$\frac{5}{16}$	$\frac{6}{20}$

TOPMASTS.—The plating should be of the thickness given in the Table. The seams of topmasts may be single riveted; the butts should be treble riveted, and their straps $\frac{1}{16}$ of an inch thicker in iron topmasts, and $\frac{1}{20}$ thicker in steel than the plates they connect. There should be doubling plates in the way of the lower mast cap. Topmasts should be efficiently strengthened in the way of the fid holes, and in the way of sheave holes where such are cut, by the doubling plates, iron hoops, or by other approved methods.

Topmast 38 feet in length and under 46 feet, to have two stiffening angles $3'' \times 2\frac{1}{2}'' \times \frac{6}{16}''$ fitted as nearly as practicable at the fore and after parts of the mast.

Where the length is 46 feet and under 66 feet, the angles to be $3\frac{1}{2}'' \times 3\frac{1}{2}'' \times \frac{6}{16}''$.

When the length of the topmasts exceeds 46 feet, efficient cheek plates are to be fitted to the same.

The diameter of the topmasts at the lower cap, sheave hole, and topmast cap, to be in no case less than that of the yards at these places.

LOWER YARDS.—The plating should be of the thickness given in the Table. The seams of yards may be single riveted; their butts should be treble riveted, and connected by being overlapped, or by efficient butt straps. The plates should be doubled at the centre, and the doubling plates should extend beyond the truss hoops.

Where iron or steel masts and yards are to be constructed otherwise than in accordance with the Tables, plans and particulars of the same must be submitted for the approval of the Committee.

Where Steamers are intended to be fitted with topmasts for auxiliary purposes, they might be one-eighth less in diameter than prescribed by Table.

Table of Sizes and Tests for the STEEL WIRE STANDING

REGISTER TONNAGE UNDER DECK.	Tons. 3000 AND UNDER 3500		Tons. 2600 AND UNDER 3000		Tons. 2300 AND UNDER 2600		Tons. 2000 AND UNDER 2300		Tons. 1800 AND UNDER 2000		Tons. 1600 AND UNDER 1800		Tons. 1400 AND UNDE 1600	
PLATING NUMBER.	32000 AND UNDER 36000		29000 AND UNDER 32000		26600 AND UNDER 29000		24200 AND UNDER 26600		22500 AND UNDER 24200		20700 AND UNDER 22500		18800 AND UNDE 20700	
	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inches.	No.	Size. inche
FORE & MAIN Shrouds ...	6 and 2 cap	$5\frac{1}{2}$	6 and 2 cap	$5\frac{1}{4}$	6 and cap	5	6 and cap	$4\frac{7}{8}$	6 and cap	$4\frac{3}{4}$	6 and cap	$4\frac{1}{2}$	6 and cap	$4\frac{1}{4}$
,, ,, Chain plates ...		$2\frac{3}{4}$		$2\frac{5}{8}$		$2\frac{1}{2}$		$2\frac{3}{8}$		$2\frac{1}{4}$		$2\frac{1}{8}$		2
,, ,, Dead-eyes ...		—		—		—		—		12×7		$11\frac{1}{2} \times 6\frac{1}{2}$		11 ×
,, ,, Lanyards (hemp)		—		—		—		—		6		$5\frac{3}{4}$		$5\frac{1}{2}$
,, ,, Rigging Screws Diameter at bottom of thread		$2\frac{1}{4}$		$2\frac{1}{8}$		2		$1\frac{7}{8}$		$1\frac{7}{8}$		$1\frac{3}{4}$		$1\frac{3}{4}$
,, ,, Rigging Screws Diameter of Pins		2		$1\frac{7}{8}$		$1\frac{3}{4}$		$1\frac{5}{8}$		$1\frac{5}{8}$		$1\frac{1}{2}$		$1\frac{1}{2}$
,, ,, Topmst. bckstys.	3	$5\frac{1}{2}$	3	$5\frac{1}{4}$	3	5	3	$4\frac{7}{8}$	3	$4\frac{3}{4}$	3	$4\frac{1}{2}$	3	$4\frac{1}{4}$
,, ,, Top-gllt. bckstys.	2	$4\frac{1}{4}$	2	$4\frac{1}{8}$	2	$3\frac{7}{8}$	2	$3\frac{3}{4}$	2	$3\frac{1}{2}$	2	$3\frac{1}{4}$	2	3
,, ,, Lower stays ...	2	$5\frac{1}{2}$	2	$5\frac{1}{4}$	2	5	2	$4\frac{7}{8}$	2	$4\frac{3}{4}$	2	$4\frac{1}{2}$	2	$4\frac{1}{4}$
,, ,, Top-mast stays...	2	$5\frac{1}{2}$	2	$5\frac{1}{4}$	2	5	2	$4\frac{7}{8}$	2	$4\frac{3}{4}$	2	$4\frac{1}{2}$	2	$4\frac{1}{4}$
,, ,, Top-gallant stays		$4\frac{1}{4}$		$4\frac{1}{8}$		$3\frac{7}{8}$		$3\frac{3}{4}$		$3\frac{1}{2}$		$3\frac{1}{4}$		3
MIZEN Shrouds	5 and cap	$4\frac{1}{2}$	5 and cap	$4\frac{3}{8}$	5 and cap	$4\frac{1}{4}$	5 and cap	$4\frac{1}{8}$	5 and cap	4	5 and cap	$3\frac{3}{4}$	5 and cap	$3\frac{1}{2}$
,, Topmast backstays ...	3	$4\frac{1}{2}$	3	$4\frac{3}{8}$	3	$4\frac{1}{4}$	3	$4\frac{1}{8}$	3	4	3	$3\frac{3}{4}$	3	$3\frac{1}{2}$
,, Top-gallant backstays ...	2	$3\frac{1}{4}$	2	$3\frac{1}{8}$	2	3	2	$2\frac{7}{8}$	2	$2\frac{3}{4}$	2	$2\frac{1}{2}$	2	$2\frac{1}{4}$
,, Lower stays	2	$4\frac{1}{2}$	2	$4\frac{3}{8}$	2	$4\frac{1}{4}$	2	$4\frac{1}{8}$	2	4	2	$3\frac{3}{4}$	2	$3\frac{1}{2}$
,, Topmast stays	2	$4\frac{1}{2}$	2	$4\frac{3}{8}$	2	$4\frac{1}{4}$	2	$4\frac{1}{8}$	2	4	2	$3\frac{3}{4}$	2	$3\frac{1}{2}$
,, Top-gallant stays ...		$3\frac{1}{4}$		$3\frac{1}{8}$		3		$2\frac{7}{8}$		$2\frac{3}{4}$		$2\frac{1}{2}$		$2\frac{1}{4}$
BOBSTAY Bar		$4\frac{1}{8}$		$4\frac{1}{8}$		4		$3\frac{7}{8}$		$3\frac{3}{4}$		$3\frac{5}{8}$		$3\frac{1}{2}$
,, Pin		$3\frac{1}{8}$		$3\frac{1}{8}$		3		$2\frac{7}{8}$		$2\frac{3}{4}$		$2\frac{5}{8}$		$2\frac{1}{2}$
,, Chain		$2\frac{1}{16}$		$2\frac{1}{16}$		2		$1\frac{15}{16}$		$1\frac{14}{16}$		$1\frac{13}{16}$		1
BOWSPRIT Shrouds (Chain) ...	2	$1\frac{1}{8}$	2	$1\frac{1}{8}$	2	$1\frac{1}{16}$	2	$1\frac{1}{16}$	2	1	2	1	2	$\frac{7}{8}$

1.—The above requirements are intended to apply to vessels in which the dimensions of the masts and yards a such as would not be deemed unusual for vessels of the respective tonnages; where these dimensions are extreme, in other exceptional cases where deviations from the above sizes are required, rigging plans showing the sizes a arrangements of the several parts should be submitted for the approval of the Committee.

2.—Where four masts are adopted instead of three, the tonnage of the vessel may be reduced one-fifth, a where five masts are adopted, one fourth, in obtaining the sizes of Rigging, &c., from the above table.

3.—Where pole masts are adopted in vessels requiring one cap shroud only, an additional cap shroud is to fitted, when the number of lower shrouds may be correspondingly reduced.

4.—Where double top-gallant yards are to be adopted, a topmast cap backstay should be fitted in addition

TABLE 11.

Tons. 1200 and under 1400	Tons. 1000 and under 1200	Tons. 800 and under 1000	Tons. 700 and under 800	Tons. 600 and under 700	Tons. 500 and under 600	Tons. 400 and under 500	Tons. 300 and under 400
16800 and under 18800	14800 and under 16800	12700 and under 14800	11600 and under 12700	10300 and under 11600	9000 and under 10300	7700 and under 9000	6100 and under 7700
No. Size. inches.	No. Size. inches.	No. Size. inches.	No. Size. inches.	No. Size. inches.	No. Size. inches.	No. Size. inches.	No. Size. inches.
6 4⅛	6 4	5 3¾	5 3½	5 3¼	5 3	4 2¾	4 2½
and cap 1⅞	and cap 1⅞	and cap 1¾	and cap 1¾	and cap 1⅝	1⅜	1¼	1¼
10½ × 6	10 × 6	9½ × 5½	9 × 5½	8½ × 5	8 × 5	7½ × 4½	7 × 4½
5¼	5	4¾	4½	4¼	4	3¾	3½
1⅝	1⅝	1½	1½	1⅜	1¼	1⅛	1⅛
1⅜	1⅜	1⅜	1⅜	1¼	1⅛	1	1
3 4⅛	3 4	2 3¾	2 3½	2 3¼	2 3	2 2¾	2 2½
2 2¾	2 2⅝	2 2½	2⅜	2¼	2⅛	2	1¾
2 4⅛	2 4	2 3¾	2 3½	2 3¼	2 3	2 2¾	2 2½
2 4⅛	2 4	2 3¾	2 3½	3¼	3	2¾	2½
2¾	2⅝	2½	2⅜	2¼	2⅛	2	1¾
5 3¼	5 3	5 2⅞	5 2¾	4 2⅝	4 2½	3 2⅜	3 2¼
and cap 3 3¼	3 3	2 2⅞	2 2¾	2 2⅝	2½	2⅜	2¼
2 2⅛	2 2	1⅞	1¾	1⅝	1½	1⅜	1¼
2 3¼	2 3	2⅞	2¾	2⅝	2½	2⅜	2¼
2 3¼	3	2⅞	2¾	2⅝	2½	2⅜	2¼
2⅛	2	1⅞	1¾	1⅝	1½	1⅜	1¼
3¼	3	2½	2¼	2	2	2	2
2¼	2⅛	1⅞	1⅝	1½	1½	1½	1½
1 10/16	1 8/16	1 6/16	1 5/16	1 4/16	1 4/16	1 4/16	1 3/16
2 7/8	2 13/16	2 12/16	12/16	11/16	10/16	9/16	9/16

STEEL WIRE STANDING RIGGING.

Size.	Breaking Test.	Size.	Breaking Test.
Inches.	Tons.	Inches.	Tons.
5½	58	3⅛	17½
5¼	53	3	16
5	48	2⅞	14½
4⅞	44	2¾	13
4¾	42	2⅝	12
4⅝	40	2½	11
4½	38	2⅜	10
4⅜	36	2¼	9
4¼	34	2⅛	8
4⅛	32	2	7
4	30	1⅞	6
3⅞	28	1¾	5½
3¾	26	1⅝	5
3⅝	24	1½	4
3½	22	1⅜	3¼
3⅜	20½	1¼	3
3¼	19		

5.—The steel wire ropes to be guaranteed to withstand the breaking stress given in the table, and no hemp is to be used in the strands, a hemp core only to be fitted.

6.—A short length of each of the wires composing the rigging will be required, after being galvanized, to withstand a tensile stress equivalent to that set forth in the Table, and the aggregate strength of the wires must not be less than 10 per cent. in excess of that stress.

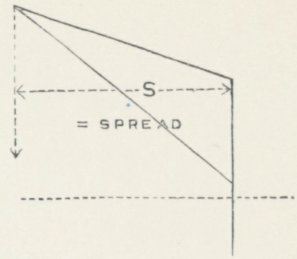
7.—Each wire will be required to be capable of being twisted around itself not less than eight times, and of being untwisted and straightened without breaking.

8.—Where it is proposed to adopt iron wire rigging the sizes proposed and the guaranteed tests should be submitted for the consideration of the Committee.

Lloyd's Register of British and Foreign Shipping,
London,
13th April, 1893.

ANCHOR CRANES.

The dimensions of the principal parts of ANCHOR CRANES to be in accordance with the following Table :—



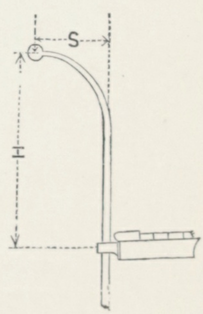
WEIGHT OF ANCHOR INCLUDING STOCK.	SPREAD OF CRANE IN FEET						
	9	10	11	12	13	14	15
Cwts.	DIAMETER OF MAIN POST AT DECK IN INCHES.						
20	6	$6\frac{1}{4}$	$6\frac{1}{2}$	$6\frac{3}{4}$	$6\frac{3}{4}$	7	$7\frac{1}{4}$
25	$6\frac{1}{2}$	$6\frac{3}{4}$	7	$7\frac{1}{4}$	$7\frac{1}{4}$	$7\frac{1}{2}$	$7\frac{3}{4}$
30	7	$7\frac{1}{4}$	$7\frac{1}{2}$	$7\frac{3}{4}$	$7\frac{3}{4}$	8	$8\frac{1}{4}$
35	$7\frac{1}{4}$	$7\frac{1}{2}$	$7\frac{3}{4}$	8	8	$8\frac{1}{4}$	$8\frac{1}{2}$
40	$7\frac{1}{2}$	$7\frac{3}{4}$	8	$8\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$	9
45	8	$8\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$
50	$8\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$
55	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$	10
60	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$	10	$10\frac{1}{4}$

CORRESPONDING DIMENSIONS OF MAIN POST, TIE RODS AND JIBS.

	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Diameter of Main Post at deck	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	8	$8\frac{1}{2}$	9	$9\frac{1}{2}$	10	$10\frac{1}{2}$
Tie Rod	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$
Jib (Diameter at middle) ...	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$5\frac{1}{4}$

If two Tie rods are fitted, the diameter of each to be $\frac{3}{4}$th that of the single rod required.

BOATS' DAVITS.



In the cases of Boats and Davits of ordinary proportions the diameter of the davits in inches should be one-fifth of the length of the boats in feet, but in cases where the height and spread of the davits or the dimensions of the boats are not of ordinary proportions, the diameter of the davits in inches should be found from the formula :—

$$\sqrt[3]{\frac{L \times B \times D}{40}\left(\frac{H}{3} + S\right)}$$

where L, B and D are the dimensions of the boat, H the height of the davit above its uppermost point of support, and S the spread of the davit, each of these dimensions being in feet.

Lloyd's Register of British and Foreign Shipping, London.—*14th April, 1904.*

TABLE 12.

"Boat and anchor davits made of approved weldless rolled or drawn steel tubes will be admitted, provided the scantlings be as required by the following table of equivalent sizes and that the steel of which the davits are made has a tensile strength of not less than 35 tons per square inch with an elongation of not less than 10 per cent. in a length of 8 inches. The davits are to have solid heels and are to be efficiently strengthened in way of the heads and deck supports."

TABLE OF EQUIVALENT SIZES.

Diameter at deck of solid davits or of main post of anchor cranes.	Diameter and thickness of approved weldless drawn steel hollow boat or anchor davits.
Ins.	Ins.
3	$4 \times \frac{4}{16}$
$3\frac{1}{4}$	$4\frac{1}{2} \times \frac{4}{16}$
$3\frac{1}{2}$	$4\frac{3}{4} \times \frac{4}{16}$
$3\frac{3}{4}$	$5\frac{1}{4} \times \frac{4}{16}$
4	$5\frac{1}{4} \times \frac{5}{16}$
$4\frac{1}{4}$	$5\frac{3}{4} \times \frac{5}{16}$
$4\frac{1}{2}$	$6 \times \frac{5}{16}$
$4\frac{3}{4}$	$6\frac{1}{2} \times \frac{5}{16}$
5	$6\frac{1}{2} \times \frac{6}{16}$
$5\frac{1}{4}$	$7 \times \frac{6}{16}$
$5\frac{1}{2}$	$7\frac{1}{4} \times \frac{6}{16}$
$5\frac{3}{4}$	$7\frac{3}{4} \times \frac{6}{16}$
6	$7\frac{3}{4} \times \frac{7}{16}$
$6\frac{1}{4}$	$8\frac{1}{4} \times \frac{7}{16}$
$6\frac{1}{2}$	$8\frac{1}{2} \times \frac{7}{16}$
$6\frac{3}{4}$	$9 \times \frac{7}{16}$
7	$9 \times \frac{8}{16}$
$7\frac{1}{4}$	$9\frac{1}{2} \times \frac{8}{16}$
$7\frac{1}{2}$	$9\frac{3}{4} \times \frac{8}{16}$
$7\frac{3}{4}$	$10\frac{1}{4} \times \frac{8}{16}$
8	$10\frac{1}{4} \times \frac{9}{16}$
$8\frac{1}{4}$	$10\frac{3}{4} \times \frac{9}{16}$
$8\frac{1}{2}$	$11 \times \frac{9}{16}$

No. 7.—FORM OF CERTIFICATE OF CHARACTER.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ESTABLISHED 1834.

No. 71, Fenchurch Street,

No. —— *London,* *190*

These are to Certify, That the —————— of —————— —————— Master, —————— Tons, bound to —————— has been Surveyed at —————— by the Surveyors to this Society, and reported to be, on the ——————

——————

and that she has been CLASSED and entered in the REGISTER BOOK of this Society with the Character

——————

Witness my hand,

—————— *Secretary.* —————— *Chairman.*

Form No. 10.—FORM OF CERTIFICATE OF LLOYD'S MC FOR ENGINES AND BOILERS.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ESTABLISHED 1834.

No. —— *No. 71, Fenchurch Street,*

London, *190*

These are to Certify, that the Engines and Boilers of the —————— of —————— Master —— Tons, have been specially Surveyed by the Surveyors to this Society, during construction at —————— and were reported to be on the —————— in good, efficient, and safe working condition, at a pressure of —— lbs. per square inch. The Record ✠ Lloyd's MC (in red) —— (Lloyd's Machinery Certificate), has been made in the Register Book.

Witness my hand,

—————— *Secretary.* —————— *Chairman.*

Form No. 11.—FORM OF CERTIFICATE OF B&MS FOR ENGINES AND BOILERS.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ESTABLISHED 1834.

No. —— *No. 71, Fenchurch Street,*

London, *190*

These are to Certify, that the Boilers of the —————— of —————— Master —— Tons, have been Surveyed at —————— in —————— by the Surveyors to this Society, and reported to be in good, efficient, and safe working condition, at a pressure of —— lbs. per square inch. The Survey being completed, the Record B&MS (in red) —— (Boilers and Machinery Surveyed), has been made in the Register Book.

—————— *Secretary.* *Witness my hand,* —————— *Chairman.*

FORM OF CERTIFICATE OF THE CLASSIFICATION OF SHIPS IN THE LATE UNDERWRITERS' REGISTER OF IRON VESSELS.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ESTABLISHED 1834.

Amalgamated 1885 with the Underwriters' Registry of Iron Vessels.

ESTABLISHED 1862.

No. ——

No. 71, Fenchurch Street,
London, 190

This is to Certify, That the ——————

of ——————, —— Master, —— Tons, bound to ——————, has been surveyed at —————— by the Surveyors to this Society, and reported to be on the —————— in a good and efficient state, and fit to carry dry and perishable Cargoes, and that she has been continued as Classed and is entered in the Register Book of this Society with the Character —————— subject to periodical Surveys.

—————— *Secretary*

Witness my hand,

—————— *Chairman.*

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING,

AND THE

UNDERWRITERS' REGISTRY FOR IRON VESSELS

AMALGAMATED.

NOTICE IS HEREBY GIVEN that it has been mutually resolved by the Committee of Lloyd's Register of British and Foreign Shipping and the Committee of the Underwriters' Registry for Iron Vessels to amalgamate the two Registries.

In accordance with the terms of amalgamation :—

(1.) The publication of the "Underwriters' List of Iron Vessels" has been discontinued.

(2.) Vessels holding a Class in the Underwriters' Registry will be entitled to the publication of this Class in future issues of Lloyd's Register Book so long as their Owners comply with the Rules of the Underwriters' Registry (1884-5) relating to Periodical Surveys.

(3.) The information hitherto given in the Supplements to the Register Book of the Underwriters' Registry relating to Periodical Surveys, Changes of Owners, &c., will be inserted by posting with type in Lloyd's Register Book and will also appear in the Supplements.

(4.) In case the Owners of Vessels holding a Class in the Underwriters' Registry only, desire also a class under Lloyd's Register, the Committee of this Society undertake to favourably consider the claims of such Vessels on the documents produced by the Underwriters' Registry, and the necessary surveys as to present condition, with a view to assigning these Vessels the highest possible Class to which they are entitled, free of charge to the Owners. Full allowance will be made for any compensation for deviation from the Rules of Lloyd's Register, and the Vessels given the advantage of any difference in scantlings between the Rules as now existing and those which were in force when the Vessels were built.

The Committee of this Society will employ the Staff of the Underwriters' Registry, so far as may be practicable, in the Survey of Vessels holding a Class in that Registry, and of Vessels now Building or Contracted to be built to Class therein.

In the interest of the Owners of Vessels Classed in the Underwriters' Registry, some Members of the Committee of that Registry will have seats on Lloyd's Register Committees in London and Liverpool.

All communications respecting vessels Classed or now Building to Class in the Underwriters' Registry should in future be addressed to the Secretary to Lloyd's Register, either in London or Liverpool, as may be most convenient.

In the absence of any intimation from Owners of Ships classed in the Underwriters' Registry to the contrary, it will be concluded that they are quite agreeable to the Classes assigned in that Registry being recorded in Lloyd's Register Book as proposed.

By order of the Committee,
B. WAYMOUTH,
Secretary.

Lloyd's Register of British and Foreign Shipping,
2, *White Lion Court, Cornhill, London,*
1*st September*, 1885.

No. 689.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court, Cornhill, E.C.,*
6th December, 1888.

SURVEY OF ENGINES AND BOILERS.

Dear Sir,

You will doubtless remember that when the late Underwriters' Registry for Iron Vessels was united with this Society's Register, it was agreed that vessels holding a class in the former Registry should be entitled to the publication of this class in future issues of Lloyd's Register Book, so long as their Owners complied with the Rules of the Underwriters' Registry, 1884-5, relating to periodical surveys.

Prior to the two Registers being united, it was contemplated by the Committee of the Underwriters' Registry to appoint Engineer Surveyors to survey the Engines and Boilers of vessels classed in that Registry.

Although, as you are aware, that proposal was not carried out, and Owners of Steam Vessels classed in the late Underwriters' Registry were consequently not liable to such a requirement, some Owners have nevertheless had the Engines and Boilers of their vessels surveyed, and the surveys have afterwards been noted in Lloyd's Register Book.

Under these circumstances, I am directed to intimate that the Committee are quite prepared to give instructions to the Society's Surveyors to survey the Engines and Boilers of the steamer hereunder named, and in the event of their being found, or put into, good condition, to make a notification to that effect in the Register Book.

It is not necessary to point out the advantages of survey by an independent body, but the Committee venture to think that now this subject is brought to your notice you will possibly come to the conclusion that it is to your interest to avail yourself of such a safeguard.

I am, Dear Sir,

Your obedient servant,

B. WAYMOUTH, *Secretary.*

N.B.—The following notations are used to denote that the engines and boilers of steam vessels have been inspected by this Society's Engineer Surveyors, and have been found or put into efficient condition, viz. :—

LMC.—Machinery certified by Lloyd's Register.

B&MS.—Boilers and Machinery surveyed and reported to be satisfactory by the Engineer Surveyors to Lloyd's Register.

✠ Special Survey of Machinery or Boilers during construction (thus ✠LMC. ✠NE&B).

No. 834.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,

14th January, 1892.

SURVEY OF ENGINES AND BOILERS.

Dear Sir,

On the 6th December, 1888, the Committee of this Society, in a circular letter which is reprinted on the other side, suggested to owners of steam vessels holding a class assigned by the late Underwriters' Registry for Iron vessels that they would do well to submit the machinery and boilers of their vessels to the inspection of the Society's Engineer Surveyors.

Although some owners have seen fit to act upon this suggestion there are many vessels still sailing, the engines and boilers of which have never been surveyed by independent Surveyors, and the Committee therefore think it right again to draw the attention of owners of such vessels to the desirableness of having the engines inspected and certified to by this Society's officers.

I am, Dear Sir,

Yours faithfully,

A. G. DRYHURST,

Secretary.

CIRCULAR No. 536.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL MAST CAPS.

SIR,

In reference to the use of cast steel mast caps, I am directed to inform you that the Committee of this Society will be prepared to admit of such steel mast caps being fitted to vessels intended to be classed in the Register Book on the following conditions :—

It is requisite that builders proposing to use cast steel mast caps shall, in the first instance, state the name of the firm by whom the caps are to be made, in order that the Committee may be satisfied that the manufacturers have proper facilities for making steel caps of a satisfactory quality.

With this object, the manufacturers will be required to give notice to the Committee when an opportunity can be afforded to the Society's surveyors to attend at the works, in order to report upon the appliances in use and the processes of manufacture, and also to ascertain by crucial tests that the material of which the caps are proposed to be made is of good and ductile quality.

Upon a favourable report being received from the Surveyors, after the inspection of the works of a manufacturer, the Committee will sanction the use of caps of his manufacture, provided test pieces be cast on the caps of sufficient size, to enable the Surveyors to subject the same to such tests as they may deem necessary, in order to satisfy themselves that the material is of good quality. The caps also are to be suspended and severely hammered in the presence of the Surveyors to ensure that the casting is sound in each case.

I am, your obedient servant,

B. WAYMOUTH, *Secretary.*

2, White Lion Court, Cornhill, E.C.,
6th November, 1884.

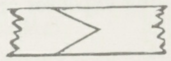
No. 583.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

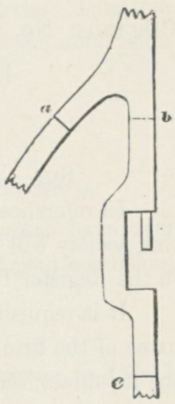
2, White Lion Court, Cornhill, London, E.C.,
January 19th, 1886.

WELDING OF LARGE FORGINGS.

SIR,

The Committee having had under their consideration the subject of the manufacture of Large Forgings for shipbuilding purposes, I am directed to state that from experiments which have been made it has been found that to ensure sound welds in heavy forgings steam hammers should be employed instead of the sledge hammers formerly used ; and the welds when of  form should have the V angle not more than 60°. The old plan of screwing the parts together at a welding heat is not found to be satisfactory, especially in forgings of considerable sectional area, and in view of this, in future the welding of forgings exceeding forty square inches in sectional area will be required by the Committee to be done with steam hammers.

It has been the practice in some works to place the "shut" of the lower part of a stern frame in the sole piece. This is considered to be very objectionable; and the Surveyor should inform manufacturers that the welding should be placed in the lower part of the posts in all cases, and that such connections in the sole piece will not be sanctioned. In Rudder frames the welds of the upper part of the frame to the main piece should not be placed close together as indicated in the sketch at *a*, *b*; but should be arranged so as to be well clear of each other as indicated by *a*, *c*.



In cases where stern frames or rudders are taken out of vessels to be repaired, the Surveyors should furnish full particulars of the defects observed, including a sketch shewing the position and nature of the fracture on the Report, for the information of the Committee, so that a record may be kept in this office of all failures in such forgings.

I am, Sir, your obedient servant,

B. WAYMOUTH,

Secretary.

NOTICE.—No. 614.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CHARGES FOR INSPECTION OF FORGINGS.

The following scale of charges has been approved by the General Committee for the inspection of forgings for other than new vessels :—

SHIP FORGINGS OR CASTINGS.

For vessels not exceeding 600 tons	£2	2	0
„ over 600 tons but not exceeding 1600 tons ...	3	3	0
„ over 1600	4	4	0

ENGINE FORGINGS OR CASTINGS.

For shafts up to 8 inches in diameter	£0	10	6
„ over 8 and up to 12 inches in diameter ...	1	1	0
„ over 12 inches in diameter	2	2	0

These fees to be chargeable for the inspection of the whole or any portion of shafting which is not being forged and finished at the works where the engines are being made under the survey of the Society's Officers, and when more than two visits are necessary, to be increased.

N.B.—Travelling expenses are to be charged in the case of both old and new vessels.

By order of the Committee,

A. G. DRYHURST,

Revised, 10*th April*, 1902. *Secretary*.

(*See Notice No.* 620.)

No. 620.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CHARGES FOR INSPECTING CASTINGS OR FORGINGS AS SET FORTH IN NOTICE No. 614.

In order to obviate misunderstanding arising in regard to the responsibility for the Payment of the Fees recently approved by the Committee of this Society for the inspection of Castings or Forgings, NOTICE IS HEREBY GIVEN that the charges in question, including travelling expenses, will be payable by the Forge or other Company by whom the forgings or castings are made.

By order of the Committee,

B. WAYMOUTH,

Secretary.

2, *White Lion Court, Cornhill, London, E.C.*,

22*nd February*, 1887.

No. 636.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

SURVEY OF REPAIRS OF DAMAGE OF SHIPS OR MACHINERY AT PORTS ABROAD.

DEAR SIR,—I am directed to draw your attention to the fact that it is a condition of the classification of vessels by this Society that all Repairs of Ships or their Machinery that may be required at ports where there is a Surveyor to the Society, in order to the vessels retaining their characters in the Register Book, must be carried out under the inspection and to the satisfaction of the Society's Surveyor.

As the non-observance of this requirement in the case of vessels requiring repairs of damage, &c., at ports abroad has in some instances occasioned inconvenience to Owners, as well as expense of further surveys, I would venture to suggest the advisability of your giving instructions to the Masters of your vessels and to your Agents abroad, in all cases where surveys are required consequent upon damage or otherwise, to call in the Society's local Surveyor to hold such surveys, in order that the vessels' character in the Register Book may be duly maintained.

I may point out that, besides complying with the requirements of the Rules of this Society for the continuance of the classification of vessels, surveys held by the Society's Surveyors abroad will also serve all the purposes of Consular Surveys, which, being, as you are aware, *purely optional*, will not then be necessary.

I am, Dear Sir,

Yours very truly,

B. WAYMOUTH,

Secretary.

2, *White Lion Court, Cornhill, London, E.C.*,

30*th August*, 1887.

NOTICE. No. 673.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

BUNKERS OF IRON AND STEEL SHIPS

SIR,—The attention of the Committee has recently been drawn to the case of a steel steamer, in which the framing, stringers and beam ends in the Coal Bunker space had almost wasted away through corrosion after a period of only 8 years, during which time, however, it would appear that the vessel inside the bunkers had never been painted.

I am directed to acquaint you that, in view of the above, more than ordinary care is required in surveying bunkers; and you are to draw the attention of owners to the advantage of thoroughly coating such parts with some good preserving composition, such as Stockholm tar sprinkled with Portland cement, or best black varnish—put on the surfaces when clean and dry—in preference to the use of ordinary paint, more particularly in steel vessels in which the scantlings are less than in those built of iron.

I am, Sir,

Your obedient servant,

2, White Lion Court, Cornhill, London, E.C.,
5th May, 1888.

B. WAYMOUTH,
Secretary.

No. 676.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

RECORD OF "EX STEAMER."

With reference to the practice of recording "ex-Steamer" in the Register Book after the names of sailing vessels that have originally been steamers,

Notice is hereby given, that the Committee, who recently had the subject under consideration, have resolved that this practice is to be continued.

The Committee, however, will be prepared to consider representations that may be made of them in regard to sailing vessels that were formerly auxiliary steamers, with a view to determining whether or not the record in question is to be made in the case of such vessels.

By order of the Committee,

2, White Lion Court, Cornhill, E.C.,
7th June, 1888.

B. WAYMOUTH, *Secretary.*

CIRCULAR No. 705.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

STEEL VESSELS.

GENTLEMEN,—With reference to the question of the liability of vessels built of steel to deterioration from corrosion, I am directed to acquaint you that the Committee of this Society, who have had this subject under their notice, think it right to place the results of their experience in regard thereto before owners of this description of property.

It is found that, in cases where the surfaces of vessels built of steel have not been properly scaled in the first instance and then protected with paint of good quality, the material is liable to great deterioration from corrosion, particularly in that portion exposed to the action of salt water. The Committee have no doubt that, with this information in your possession, you will see the desirability of taking the precaution of having new steel vessels belonging to you placed in dry dock and examined, within six months from the date of launching, so that, if symptoms of corrosion are found, the bottom may be properly scaled and coated.

I am also directed to point out the importance of having the inside and outside surfaces of steel vessels kept free from scale, and properly painted.

I am, Gentlemen, your obedient servant,

B. WAYMOUTH, *Secretary.*

2, White Lion Court, Cornhill, London, E.C.,
7th March, 1889.

CIRCULAR NO. 722.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
1st September, 1889.

PETROLEUM VESSELS.

SIR,

With reference to the testing of the tanks of vessels intended to carry oil, I have to acquaint you that the Committee are of opinion that such tanks should be capable of withstanding a pressure of a head of water 15 feet above the crown of the tank, which would be equal to a pressure of 6lbs. per square inch.

I am, Sir, your obedient servant,

B. WAYMOUTH, *Secretary.*

CIRCULAR NO. 773.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
14th August, 1890.

DOUBLING PLATES IN BOILERS.

SIR,

The attention of the Committee has been drawn to the case of a boiler in which the lower parts of the combustion chambers, instead of having been constructed in the usual manner of one plate of sufficient thickness, was made of a comparatively thin plate strengthened by a doubling plate, with the result that the inner plating became bulged and boiler rendered leaky.

In view of the above I am directed to draw your attention to the necessity of seeing that no doubling plates are fitted in any boiler in positions where they are exposed to the action of the heat of the fires. In such positions the necessary strength should be provided for, if possible, by using a single plate of sufficient thickness, or, where this is impracticable the plates should be strengthened by stays or by L or ⊥ bars.

I am, Sir, your obedient servant,

B. WAYMOUTH, *Secretary.*

CIRCULAR No. 831.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court*, *Cornhill*, *London*, *E.C.*,
30*th November*, 1891.

OIL-CARRYING VESSELS.

SIR,

I am directed to send for your information results, which the Committee consider may be found useful, of the experience gained by the Officers of this Society respecting the effects on the hulls of some vessels constructed for the purpose of carrying oil in bulk when some of their tanks have been used for carrying water ballast.

It has been found that, in ballasting such vessels with water, the consecutive tanks in some cases have not been run up, and, by thus leaving empty spaces in the main body of the vessel, undue strains have been brought upon the structure at these parts, leading to considerable damage to the vessel.

In other cases, sufficient care has not been taken to ensure that the tanks have been quite filled, and kept filled; and a deep empty tank has even sometimes been run up at sea whilst the vessel was encountering heavy weather. By these means, great strains and damage have been caused from masses of free water being brought against the bulkheads, &c., internally.

It should be borne in mind that carrying liquid in bulk, independently of the nature of the cargo, causes considerably more straining on the plating and riveting of vessels than would occur in carrying general cargo. In the former instance the weight of the cargo is brought only on the outside plating, whereas with general cargo a great portion of the strain is borne by the floors, frames, keelsons, stringers, &c. Great precaution is therefore necessary in oil-carrying vessels to prevent the strains, which are necessarily exceptional, from being materially intensified by the action within the vessel of large quantities of moving oil or water.

It may not be out of place to remark that provision, as regards the trim of the vessel, should be made so that the consecutive tanks in the midship part can be quite filled. These spaces should be sub-divided, particularly at the fore end, to such an extent that the trim of the vessel will admit of the tanks being quite filled, without the statutory depth of loading being exceeded.

Experience has also shown that danger arises from not filling the water spaces at the end of the stokehold with water so as to prevent oil finding its way into the coal bunkers and saturating the coals.

I am, Sir,

Your obedient servant,

A. G. DRYHURST, *Secretary.*

Circular No. 832.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court*, *Cornhill*, *E.C.*,
7th December, 1891.

FEEDERS IN GRAIN-LADEN VESSELS.

Sir,

I am instructed to draw your attention to a case that has recently occurred, in which a grain-laden steamer capsized owing to the giving way of the feeders in the 'tween decks, and a large portion of the grain contained in them being thrown towards one side of the vessel.

In the case in question, the lower holds were completely filled with grain in bulk and the hatchways were utilized as feeders, formed of planks round the hatchways. Additional feeders were also provided at the sides of the vessel extending from the main to the upper deck.

From investigations made by the Officers of this Society it has been found that, as compared with similar vessels loaded in the same manner, the vessel in question had both considerable initial stability, due to her comparatively large metacentric height, and also a good range of stability, due to her large freeboard. There is no reason, therefore, to conclude that the accident was in any way due to an inherent want of stability.

The heeling of the vessel, however, caused by the grain from the feeders being thrown on one side, conduced to the cargo gradually settling down on the depressed side and thus continuously increasing the angle of the heel, until capsizing occurred.

Under these circumstances, it is considered useful to draw the attention of Shipowners to the fact that although feeders are a source of safety in grain laden vessels, in providing for the holds being kept full on the grain settling down, yet if they be not efficiently constructed, and properly shored at the sides and ends, they may lead to danger, as instanced in the case referred to.

I am, Sir, your obedient servant,
A. G. DRYHURST, *Secretary*.

Circular No. 847.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court*, *Cornhill*, *E.C.*,
23rd June, 1892.

Sir,

With reference to the cases of vessels in which the steel or iron decks required by the Society's Rules are not carried continuously throughout the length of the vessels, I am directed to acquaint you for your guidance, that in vessels having a raised quarter connected to a bridge house, and requiring by Table S 5 more than one iron or steel deck, the bridge house should extend over not less than the half length amidships, to comply practically with this requirement.

I am, Sir,
Your obedient servant,
A. G. DRYHURST, *Secretary*.

No. 851.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

ANCHORS AND CABLES.

NOTICE IS HEREBY GIVEN that the notation of Lloyd'sA&CP (**Lloyd's Anchors and Chains Proved**) is made in the Society's Register Book in the case of Vessels, the **Anchors** and **Chains** of which have been tested at Proving Establishments under the control of the COMMITTEE of LLOYD'S REGISTER OF SHIPPING.

The following establishments are under the control of the Committee :—

Lloyd's Proving House, NETHERTON (nr. Dudley)	*Superintendent*	Mr. H. Green.
Lloyd's Proving House, TIPTON (Staffordshire)	„	Mr. C. E. Perrins.
Lloyd's Proving House, LOW-WALKER-ON-TYNE	„	Mr. S. C. Paul.
Lloyd's Proving House, CHESTER (Saltney)	„	Mr. H. T. Welford.
Lloyd's Proving House, GLASGOW	„	Mr. E. Seedhouse.
Lloyd's Proving House, CARDIFF	„	Mr. G. W. Penn.
Lloyd's Proving House, SUNDERLAND	„	Mr. W. J. Relf.
Lloyd's Proving House, CRADLEY HEATH	„	Mr. T. H. Dudley.

By order of the Committee,

A. G. DRYHURST, *Secretary.*

Revised, London, February, 1903.

CIRCULAR NO. 852.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, White Lion Court, Cornhill, E.C.,
27th September, 1892.

SIR,

It having recently come to the knowledge of the Committee that, in some vessels where Pitch Pine decks have been fitted, damage to cargo has resulted from leakage, owing to the shrinking of the decks, and to rents and shakes, I am directed to inform you that, in cases where it is intended to fit the weather decks of Pitch Pine in vessels classed, or intended for classification in the Society's Register Book, you are to take steps to ensure that the decks have been well seasoned after being cut.

Special attention should also be directed to the laying of decks of this material and to the caulking of the seams and rents.

I am, Sir, your obedient servant,

A. G. DRYHURST, *Secretary.*

NOTICE No. 895.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

RECORD OF TEAK DECKS IN THE REGISTER BOOK.

NOTICE IS HEREBY GIVEN that in any case in which the working weather deck of vessels classed under the Two or Three Deck Rule, or Spar Deck or Awning Deck Rules, is of teak, the Committee will be prepared to record the fact in the Society's Register Book (thus "Deck Teak"), upon receiving a request to that effect from the owners, and subject to the deck being examined by the Society's Surveyors, and found to be in good condition.

In the case of a vessel having a bridge house, the deck in the alleyways must in order to render her eligible for the above notation, be of teak, but it is not required that in such cases the Poop, Bridge, and Topgallant Forecastle decks, shall be of East India Teak.

By order of the Committee,

A. G. DRYHURST,

Secretary.

2, *White Lion Court, Cornhill, London, E.C.,*
2nd November, 1893.

CIRCULAR No. 912.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court, Cornhill, E.C.,*
22nd October, 1894.

BOILER MANHOLES AND FITTINGS.

SIR,

The Committee's attention has been drawn to some accidents which have recently occurred to boilers of classed vessels in consequence of the bad fitting of manhole doors and of drain plugs, some of which have been attended with fatal results. I am directed, therefore, to remind you that in surveying boilers, new or otherwise, your examination should include not only the boilers, but also all the mountings and their fastenings, and the manhole doors and their fastenings, special attention being given to the fit of the spigots of the doors in the manholes. These should be so well fitted and of such a depth as to render it absolutely impossible for the jointing material to be forced out between the spigot and the boiler plate, even when the door is so placed that the clearance is all on one side.

I am, Sir, your obedient servant,

A. G. DRYHURST,

Secretary.

NOTICE NO. 920.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

REDUCTION OF FEES.

NOTICE IS HEREBY GIVEN that the General Committee, at a Special Meeting held this day, have determined that, on and after 1st January, 1895 and until otherwise ordered, an abatement of 10 per cent. shall be allowed from all fees chargeable after that date for surveys held in the United Kingdom on old ships and old engines and boilers.

By order of the Committee,

A. G. DRYHURST,

Secretary.

2, *White Lion Court, Cornhill, London, E.C.,*
20*th December*, 1894.

CIRCULAR NO. 982.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

2, *White Lion Court, Cornhill, E.C.*
29*th April*, 1897.

SHAFTING.

Sir,

The subject of the numerous failures and condemnations of screw shafts has recently been under the consideration of the Committee, and it has been suggested that in some cases the failure of these shafts has been due to their having been worked out of line. I am therefore directed to request that in the cases of new vessels engined under your survey you will pay great attention to this matter, assuring yourself, as far as possible by personal inspection, that the stern tube and shaft bearings are so placed in the vessel as to ensure the shafting being in true line throughout.

Considerable importance is also attached to maintaining the shafting in line, especially as regards the screw shaft, it being thought that considerable risk often arises from the stern bush being allowed to become worn, and that fewer failures of these shafts would occur if the bushes were more frequently lined up. In drawing your particular attention to this point, I am to request that in reporting the results of Surveys held in Dry Dock you will in all cases state on your report the amount the stern bush is actually worn, taking care that the measurement of the wear is ascertained from the bush itself, and not from the outer ring, which may not in all cases be true with the bush. I am further to request that in all cases when screw or other shafts are renewed under your survey you will state in your report particulars of the defects in the shaft, and in cases where you are able to form a decided opinion, the cause to which the defects are attributable.

I am, Sir,

Your obedient servant,

A. G. DRYHURST,

Secretary.

NOTICE No. 1087.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING

NOTICE IS HEREBY GIVEN THAT THE FOLLOWING ALTERATIONS AND AMENDMENTS HAVE BEEN MADE BY THE GENERAL COMMITTEE IN THE RULES OF THE SOCIETY.

RULES FOR THE BUILDING AND CLASSIFICATION OF STEEL VESSELS.

FITTING OF CEILING.

Section 25, page 81, has been amended to read as follows, viz.:—

Section 25. 1. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed; *but the ceiling on the double bottom of a cargo hold may be omitted, except under the hatchways and over the limbers at the bilges.*

2. The ceiling on the floors *of vessels not having double bottoms* should be made in hatches where practicable, of convenient sizes, and when not so arranged, to be fastened to the reversed angle bars or frames in such a manner as to be removed when required for the purpose of survey, or for cleaning and painting.

3. For thickness of ceiling, *see* Table S 3.

4. Cargo battens to be fitted from the upper part of the bilges upwards, including the 'tween decks of all types of vessels, and in permanently enclosed spaces in bridge houses, poops and other deck erections. In spaces exclusively intended for carrying coal, cargo battens may be dispensed with.

5. Vessels exclusively engaged in carrying coal, ore, or wood, need not have cargo battens fitted, but in such case the certificate of classification will have the following words written on it, "Subject to the vessel being engaged exclusively in carrying coal, ore, or wood, while without cargo battens."

RULES FOR THE MACHINERY OF STEAM VESSELS.

FURNACES.

Paragraph 56, page 117, has been amended to read as follows, viz. :—

"The strength of Improved Purves' furnaces with ribs 9 inches apart, and of Brown's Cambered furnaces with ribs either 8 inches or 9 inches apart."

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.
14th December, 1905.

N.B.—The above-mentioned alterations and amendments are embodied in the issue of the Rules for Steel Vessels for 1906–1907.

EXTRACTS FROM NOTICE No. 1088.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE IS HEREBY GIVEN THAT THE FOLLOWING ALTERATIONS AND AMENDMENTS HAVE BEEN MADE BY THE GENERAL COMMITTEE IN THE RULES OF THE SOCIETY REGARDING THE QUALITY AND TESTING OF SHIP AND BOILER STEEL.

RULES FOR THE BUILDING AND CLASSIFICATION OF STEEL VESSELS.

Section 3.—QUALITY AND TESTING OF SHIP STEEL.

This Section, pages 46–48, has been amended and rearranged throughout, to bring the requirements into accord with the Standard Specifications issued by the Engineering Standards Committee.

RULES FOR THE MACHINERY OF STEAM VESSELS.

QUALITY AND TESTING OF BOILER STEEL.

Paragraph 19, pages 107–109, has been amended and rearranged throughout, to bring the requirements into accord with the Standard Specifications issued by the Engineering Standards Committee.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, FENCHURCH STREET, LONDON, E.C.

14th December, 1905.

N.B.—The above-mentioned alterations and amendments are embodied in the issue of the Rules for Steel Vessels for 1906–1907.

EXTRACTS FROM NOTICE No. 1109.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

NOTICE IS HEREBY GIVEN THAT THE FOLLOWING ALTERATIONS AND AMENDMENTS HAVE BEEN MADE BY THE GENERAL COMMITTEE IN THE RULES OF THE SOCIETY.

RULES FOR THE BUILDING AND CLASSIFICATION OF STEEL VESSELS.

EQUIPMENT OF SAILING AND STEAM TRAWLERS AND TUGS.

The Equipment Table for Sailing and Steam Trawlers and Tugs, printed on the back of Table 22, has been extended by four grades, as shown in the table in the body of the Rules.

Section 3.—QUALITY AND TESTING OF SHIP STEEL.

This Section, pages 46–48, as amended in Notice No. 1088, dated 14th December, 1905, has had the following paragraph 18 added, viz. :—

"18. GENERAL.—Besides the foregoing tests, samples of all material may be subjected to additional tests at the discretion of the Surveyors."

ATTACHMENTS TO CROWNS OF PEAK TANKS.

The following clauses have been added to paragraph 17 of Section 24, viz. :—

"**Attachment where frames and reversed frames are cut at the tops of peak tanks of ordinary length.**

Frame Number.	Depth of bracket measured from outside plating.	Number of Rivets.
31 and under 57	15 inches.	4 of $\frac{5}{8}$ inch.
57 " " 71	18 "	4 " $\frac{3}{4}$ "
71 " " 80	21 "	5 " $\frac{3}{4}$ "
80 " " 97	24 "	6 " $\frac{3}{4}$ "
97 " " 115	27 "	7 " $\frac{3}{4}$ "
115 " " 130	30 "	7 " $\frac{7}{8}$ "

"Brackets are to be fitted at every frame of the same thickness as the frame, and are to be attached to the tank top plating by means of single angles of the size required for lower deck stringer angles.

"Where only the reversed frames are cut, and not the frames, the bracket attachments as above are to be fitted to alternate frames.

"Alternative arrangements of equal efficiency to the above will receive the Committee's approval."

RULES FOR THE MACHINERY OF STEAM VESSELS.

QUALITY AND TESTING OF BOILER STEEL.

Paragraph 19, pages 107–109, as amended in Notice No. 1088, dated 14th December, 1905, has had the following sub-paragraph 17 added, viz. :—

"17. **General.**—Besides the foregoing tests, samples of all material may be subjected to additional tests at the discretion of the Surveyors."

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.

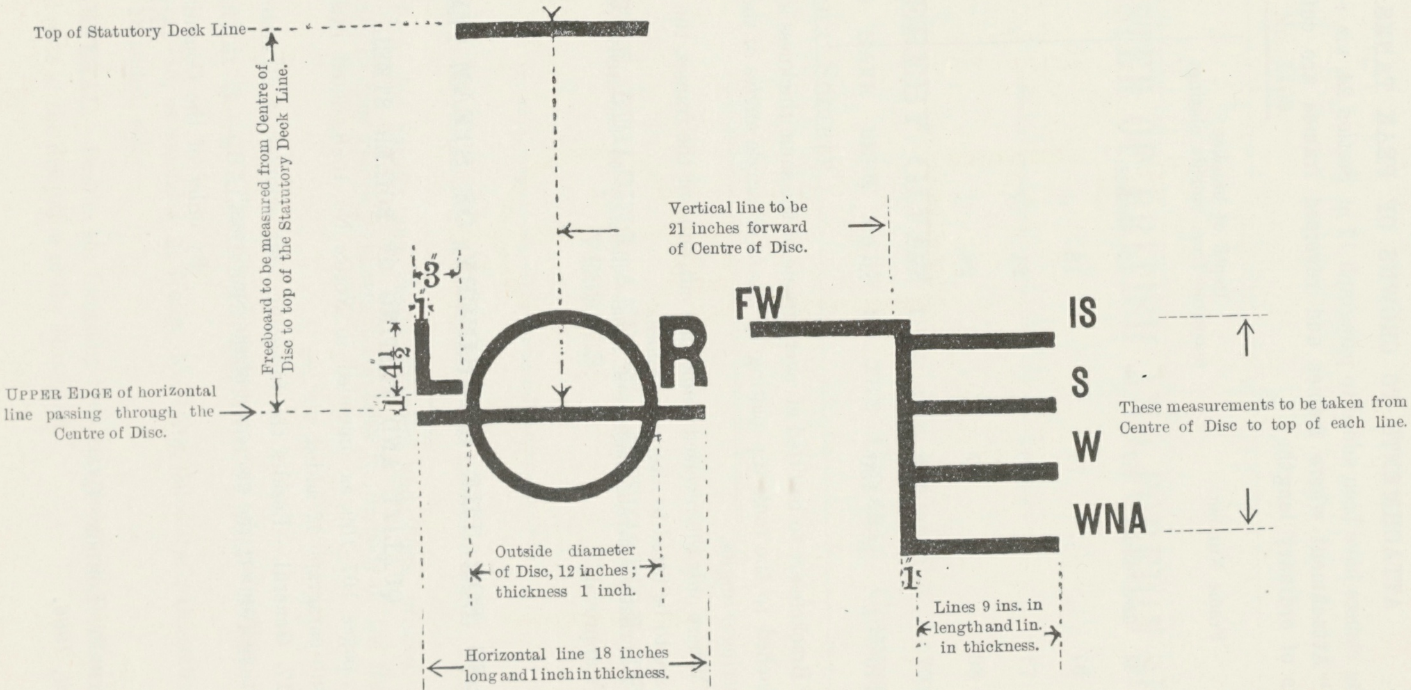
26th April, 1906.

ASSIGNMENT OF FREEBOARD.

Under the Merchant Shipping Act, 1894, the Committee of Lloyd's Register are empowered to assign freeboards to British Vessels as required by the Act. Forms of application for the assignment of freeboard can be obtained from the London, or other, offices of the Society.

The mode of Marking, approved by the Board of Trade, is as follows:—

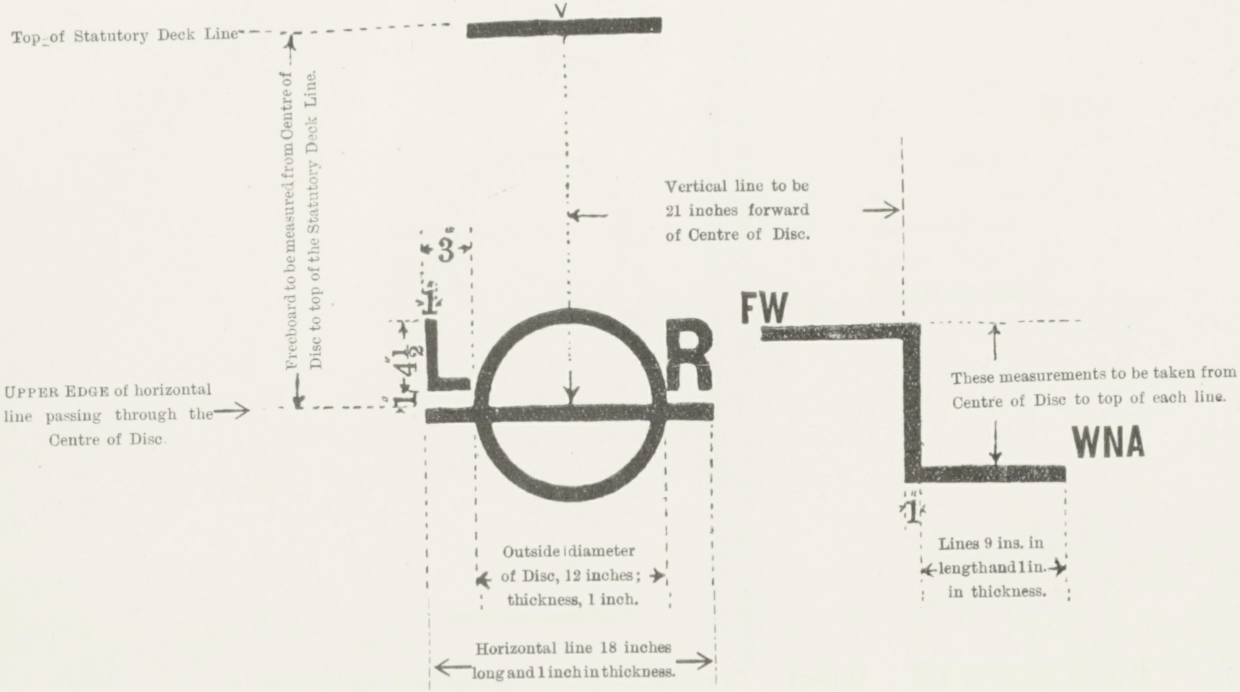
FREEBOARD MARKING FOR STEAMERS.



The Centre of Disc to be placed on both sides of vessel amidships, *i.e.*, at the middle of the length of the load water line. Vessels are to be marked with such of the horizontal lines are as applicable to the nature of their employment. In accordance with the regulations made by the Board of Trade, the discs and lines must be permanently marked by centre punch marks or cutting, and the particulars given in the Certificate are to be entered in the official log.

N.B.—It is a condition on which an awning or partial awning-decked vessel is classed in the Society's Register Book that the Freeboard assigned shall be marked on the vessel's sides as above prescribed ; and, under the provisions of Section 43 of the Society's Rules for Iron or Steel Ships. If the vessel proceed to sea with a less freeboard than that approved by the Committee, or if the freeboard mark be placed higher than the position assigned by the Committee, the vessel will be liable to have her class expunged from the Register Book.

FREEBOARD MARKING FOR SAILING VESSELS.



The Centre of Disc to be placed on both sides of vessel amidships, *i.e.*, at the middle of the length of the load line. Coasting vessels are required to be marked with only the maximum load line in fresh water. In accordance with the regulations made by the Board of Trade, the disc and lines must be permanently marked by centre punch marks or cutting, and the particulars given in the Certificate are to be entered in the official log.

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1906.